DOCUMENT RESUME

ED 134 403 SE 021 383

AUTHOR	Purnell, Charlotte H.; Bolig, John R.
TITLE	A Description of Del Mod and Its Final Evaluation, Final Report, Volume I.
INSTITUTION	Del Mod System, Dover, Del.
SPONS AGENCY	National Science Foundation, Washington, D.C.
PUB DATE	[76]
NOTE	121p.; For related documents, see SE 021 384-387
EDRS PRICE	MF-$0.83 HC-$6.01 Plus Postage.
DESCRIPTORS	*Curriculum Development; Elementary School Mathematics; Elementary School Science; *Elementary Secondary Education; *Inservice Education; *Mathematics Education; *Science Education; Secondary School Mathematics; Secondary School Science; *Teacher Education
IDENTIFIERS	*Delaware

ABSTRACT

This monograph presents an overview of five Del Mod System final reports, comments by the project director, financial structure of the Del Mod System, and descriptions of Del Mod Projects. The Del Mod System was concerned with changing the science and mathematics education programs in the state of Delaware. Between 1970 and 1976, Del Mod conducted 208 separately funded projects ranging from one day to one year. Each of these is briefly described and includes title of the project, number of participants, and a brief summary of each project's activities. (RH)

****
* Documents acquired by ERIC include many informal unpublished *
* materials not available from other sources. ERIC makes every effort *
* to obtain the best copy available. Nevertheless, items of marginal *
* reproducibility are often encountered and this affects the quality *
* of the microfiche and hardcopy reproductions ERIC makes available *
* via the ERIC Document Reproduction Service (EDRS). EDRS is not *
* responsible for the quality of the original document. Reproductions *
* supplied by EDRS are the best that can be made from the original. *
****

13

del-mod system

1971-1976

STATE OF DELAWARE

ED134403

A Description of Del Mod and Its Evaluation

Charlotte H. Purnell
John R. Bolig

U S DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

FINAL REPORT

VOLUME I

SE 021 383

AUG 1 8 1976

A DESCRIPTION OF DEL MOD AND ITS FINAL EVALUATION

By

Charlotte H. Purnell, Director
John R. Bolig, Research Director

TABLE OF CONTENTS

	PAGE
FOREWORD	iii
CHAPTER ONE: The Del Mod Final Reports, Dr. John Bolig	1
Background	2
Del Mod's Philosophy	4
Methodology	5
Unused Data	6
Contents of This Volume	6
CHAPTER TWO: The Del Mod System: A View From the Top, Charlotte H. Purnell	7
CHAPTER THREE: The Financial Structure of the Del Mod System, Dr. John R. Bolig	15
Introduction	16
The Structure of Del Mod	16
Del Mod Allocations	17
Del Mod Programs	17
The Impact of Del Mod	18
Fiscal Policies	19
Comments	20
Conclusions	20
CHAPTER FOUR: Del Mod Project Descriptions, Sarah Richardson, Uldis R. Golts, and Dr. John R. Bolig	26
Project 70-01	28
FY 1971 Projects	29
FY 1972 Projects	36
FY 1973 Projects	58
FY 1974 Projects	83
FY 1975 Projects	103
Additional Del Mod Projects	111

FOREWORD

A large number of people worked to administer or conduct the business of the Del Mod System. These people are listed below and we hope there are no inadvertent omissions. We are sure they share with us a dedication of these volumes to the people of the State of Delaware

Mrs. Charlotte Purnell
Del Mod System Director

Dr. John R. Bolig
Research Director

The following people are or were Del Mod Field Agents:

Mr. John Reiher, Science Field Agent
Mr. Al Burkhardt, Science Field Agent
Ms. Loretto Clark, Science Field Agent
Mr. James H. Gussett, Science Field Agent
Ms. Barbara A. Logan, Science Field Agent
Mrs. Frances Barhydt, Science Field Agent
Mrs. Audrey Conaway, Project Assistant to Director's Office
Mrs. Susan Hartzler, Science Field Agent
Mr. Thomas Hounsell, Science Field Agent
Mr. Dennis Reilly, Science Field Agent and du Pont Fellow
Mr. Bruce Watt, Science Field Agent
Mr. Verne Wood, Science Field Agent
Dr. Richard E. Cowan, Mathematics Field Agent
Mr. Meredith Griffin, du Pont Supervisory Intern
Mr. Peter Shannon, du Pont Fellow, Mathematics
Mr. Charles A. Wall, Science Field Agent

The following people held past positions of responsibility in the System:

Dr. M. Milford Caldwell, Delaware State College
Dr. Columbus Ricks, Delaware State College
Dr. Ronald Machen, Delaware State College
Dr. Ruth Cornell, Del Mod Office
Mr. David Morgan, Department of Public Instruction
Ms. Barbara Westbrook, Del Mod Office

The Del Mod System Office:

Mr. Uldis Golts, Technical Writer
Ms. Sarah Richardson, Research Technician
Mr. Charles Wall, Research Field Agent
Mrs. Donna Starcher, Administrative Secretary

Delaware State College:

Dr. Luna Mishoe, President
Dr. Theophilus McKinney, Dean
Mr. Ralph Hazelton, Component Coordinator
Mr. Leon Gardner, Director, Resource Center
Mrs. Claretta Davis, Secretary

Delaware Technical and Community College:

Mr. Paul Weatherly, President
Dr. Ruth Laws, Assistant to President
Mrs. Ethel Lantis, Dean of Development
Mrs. Eleanor Sloan, Director, Resource Center
Mr. Charles Sutcliffe, Director, Instrument Repair Center
Mrs. Susan Pepper, Secretary

Department of Public Instruction:

Dr. Kenneth Madden, Superintendent
Dr. Randall Broyles, Assistant Superintendent
Mr. John Reiher, State Science Supervisor
Mr. Thomas Baker, Del Mod Dissemination Specialist
Mrs. Connie Fifer, Secretary

University of Delaware:

Dr. E. A. Trabant, President
Dr. Daniel Neale, Dean, School of Education
Dr. Carlton Knight, Del Mod Component Coordinator
Dr. Robert Uffelman, Director, Resource Center
Mrs. Frances Pontius, Secretary

Chapter One

THE DEL MOD FINAL REPORTS

John R. Bolig
Research Director

THE DEL MOD FINAL REPORTS

Chapter One

Del Mod research and evaluation both have a history and a methodology which must be considered in the examination of the documents which comprise the final reports.

Rather than write one extensive summary document, the Del Mod Research component concluded over a year ago that various audiences would require specific descriptions and evidence of success about portions of the Del Mod System such as the field agent or resource center concepts, and that these reports should be separate.

There are a number of serious restraints under which the research activities of the System were forced to operate. Furthermore, the history of Del Mod evaluation is especially frustrating. These topics must be weighed before all other topics are considered.

Background

Del Mod research was implemented in 1970 strictly for the gathering of baseline data. These data were meant to supplement existing documents and to provide a bench mark by which Del Mod could be measured. A data analyst was employed and given eight specific duties to perform. When these duties had been accomplished, it was decided mutually by the NSF and the Del Mod System that a permanent research director would be useful for the operation of the System.

The Research Director's duties were to include the preservation of the baseline data for future comparisons, collection of data about Del Mod projects, and such duties as delegated by Mrs. Purnell, Del Mod's director throughout its history. The position was little more than an afterthought on the part of the NSF, and, in fact, had been most strongly advocated by Dr. Pratt of the DuPont company. It was never a well funded activity of the System. The total expenditure on research and evaluation, including the salaries and fringe benefits of the research director, amounted to less than 4.8% of Del Mod's allocation.

Evaluation was never seriously considered as an integral part of Del Mod before the first year of Del Mod's existence, but the Research Director and Mrs. Purnell began to have serious

concerns about the evaluation of the System and they began to lobby for funds and expertise to conduct evaluation. Three endeavors along these lines all proved fruitless.

Mrs. Purnell, Dr. Bolig, and Dr. Pratt traveled to Johns Hopkins University to discuss evaluation of Del Mod with Dr. James Coleman whose experiences at large scale evaluations was nationally recognized. His advice to Del Mod was to "measure everything."

Mrs. Purnell and Dr. Bolig next made contacts with the Education Commission of the States, specifically the science education experts at the Research Triangle in North Carolina. They too suggested that we measure everything or that we employ them to do so. Their fee for such work was equal to Del Mod's entire budget.

With all due respect to the experts in the field, Del Mod felt that their advice was vague and the price overwhelming. Mrs. Purnell and Dr. Bolig then appealed to the National Science Foundation for assistance. Dr. Buccino of the NSF listened to Del Mod's concerns and agreed that some form of evaluation was definitely required, and that he would see what he could do to assist.

The events which occured following this meeting defy unbiased description. Dr. Buccino, for some perverse reason, employed a group of nationally recognized evaluators to prepare a proposal for evaluating Del Mod. The proposal was finalized and funded before Del Mod was advised of its existance. When it was presented to Mrs. Purnell and Dr. Bolig, they raised serious questions about the ethics of Dr. Buccino and the evaluators in devising an evaluation plan at Del Mod's request but without Del Mod's input. There were also serious questions about the design of the plan.

The evaluation was imposed upon Del Mod and we were treated as hostile witnesses by the evaluation team which visited Delaware. The results of the evaluation were mixed. Descriptions of the Del Mod System were quite flattering and in most instances they were accurate and unbiased. But, Del Mod was soundly condemned for its lack of evaluation. That conclusion was unjust because the internally felt need for evaluation was the exact reason why the NSF- sponsored evaluation team had been called in. One of the evaluators Dr. Scrivens, who was spectacularly unprofessional because he never bothered to visit Delaware, went so far as to conclude that the Research Director was incompentent and should be discharged.

Finally, the components of the System felt that the Stufflebeam evaluation team sent in by the NSF had run roughshod over the schools of Delaware. This team gave the concept of evaluation a bad name. One of the advance men for Stufflebeam set the

stage by announcing that his chore was to "find all the dirt" about Del Mod.

Stufflebeam then flooded Delaware with lengthy questionnaires which were unexpected by the superintendents of Delaware's school districts, and he compounded the error by sending as many as nine questionnaires to single individuals. It was very difficult for Del Mod to overcome the hostility generated by Stufflebeam's evaluation.

The pain and indignity of the evaluators' conclusions created some interesting reactions in Delaware. The Research Director was not discharged, in fact several efforts were made to augment his budget and to provide him with assistance. And, an outside group was asked to assist Del Mod in the design and implementation of reasonable evaluation procedures.

This group also proved to be unable to provide a manageable plan at a reasonable cost, and it was released from its contract by mutual agreement. The problem of evaluating Del Mod was placed in the hands of Dr. Bolig, and he was given two assistants to complete the work.

Del Mod's Philosophy

Before the design of the final Del Mod evaluation is examined, a description of Del Mod's philosophy should be considered. From the offset of Del Mod in 1970, the objective of the System was to have as much of an impact as possible upon teachers of science in Delaware. All of Del Mod's funding agencies and all institutions committed to Del Mod in Delaware subscribed to this objective. Any attempt to allocate monies otherwise was challenged by all parties, and evaluation was invariably challenged. For three years only one person was expected to research, evaluate, and preserve data on a project of statewide scope, of national interest, and costing almost three million dollars. Each of Del Mod's components had needs for data for decision making, but none were willing to expose themselves to evaluation. At this point, the Research Director had a clear cut mandate to do research and each component had a vested interest in cooperating, but the Research Director was given relatively no money and had little power to influence the components of the System.

From 1970-1976 the Department of Public Instruction in Delaware, which had the sanctions to enter Delaware's schools to test and evaluate children and programs, did almost nothing to assist Del Mod in its data gathering. State achievement testing was inflicted on Districts and this was not systematically done. These tests were political footballs and probably have no validity at all. Del Mod has made an effort to examine state test results and these will be discussed in Volume V.

The University of Delaware which is the most prestigious academic institution in Delaware made no effort to research or evaluate any aspect of Del Mod. The three doctoral dissertations which relate to Del Mod were all done for out-of-state universities. Del Mod's Research Director made annual pleas for assistance from the University's science education and educational research faculty members to no avail.

Certainly these and all other Del Mod research and evaluation shortcomings could be blamed upon failures of the component institutions to grasp the true concept of a systems approach but to the extent that this may be true, there is sufficient evidence that a large evaluation effort has been made. This effort is described on the following pages.

Methodology

The division of Del Mod's final report into five volumes was decided upon after an analysis of requests for information about Del Mod were scrutinized. Descriptions of the field agent activities within Del Mod, for example, seemed to require a detailed separate report. It is unlikely that a systems-approach to education will be attempted in other localities, but it is possible that separate facets of Del Mod will appeal to specific audiences.

The five volumes include a description of the evaluation, a description of the resource centers, a description of the field agents, an external evaluation done in 1976, and statistical comparisons of Del Mod data collected during 1970-1971 and 1975-1976.

Mrs. Purnell and Dr. Bolig authored Volume One which provides an overview of the System and its history.

Dr. Bolig supervised the data collection and writing of Volumes Two and Three which were authored by Sara Richardson and Uldis Golts, respectively. These volumes extensively describe Del Mod resource centers and field agents. Each volume also discusses interactions between centers or agents and all other aspects of Del Mod, and either volume can be read independently of any other Del Mod document.

Dr. Bolig commissioned the fourth volume and designed the evaluation of Del Mod by an external team. This evaluation of Del Mod was loosely based upon work done by Dr. Robert Stake, who advocated analyzing the outcomes of a project independent of the goals and objectives of the project. Eighteen people participated in evaluating Del Mod and the evaluation was summarized by Dr. Donald Humphreys of Temple University. It was felt that the design of the evaluation should also be examined for validity

and this was done by Dr. Kenneth Dowling of the Wisconsin State Department of Education.

The fifth volume is a compendium of data collected by Dr. Bolig between 1970 and 1976. Any data which afforded Del Mod an opportunity to make pre- post comparisons are included. The analysis of these data was completed by Dr. Bolig and Charles Wall, a Del Mod research field agent. This report includes a follow-up study of the first Del Mod project participants, and extensive comparisons of the various achievement tests employed to measure the progress of children in science in Delaware's schools.

A sixth volume on Del Mod impact on mathematics education is tentatively planned but has not been undertaken.

Unused Data

Over the six years which comprise the data gathering period of Del Mod, other information has been collected and analyzed, much of which has not been reported upon. Most of Del Mod's projects carried data collection requirements. Longitudinal studies were conducted on many of Del Mod's participants. Some studies were interrupted by constraints of time or money, and some because of unforeseen problems. Video tape analysis, for example, was extensively undertaken until 1974 when union contracts began to exclude video taping of classroom teaching as an activity in which teachers might participate. Del Mod has since erased all of its video tapes and has had to forego analysis of tests given to its participants.

Field agents specifically urged the Del Mod Research Director to reduce their research and evaluation responsibilities, which were clearly mandated in early Del Mod proposals. It was felt that these duties inhibited the confidentiality and rapport required in a field agent/teacher relationship. In this instance, pretest data may exist, but no post tests were undertaken. All unused data which exist at this writing will be preserved for future study.

Contents of This Volume

The Chapters which follow contain the overview of Del Mod from the perspective of its Director, Mrs. Charlotte Purnell; a study of Del Mod's financial structure; and summaries of all Del Mod funded projects from 1970 to 1976. Taken as a whole, this report offers some idea of the scope of the System, its cost, and problems encountered in its administration and evaluation.

Chapter Two

THE DEL MOD SYSTEM: A VIEW FROM THE TOP

Charlotte Purnell
Director

THE DEL MOD SYSTEM: A VIEW FROM THE TOP

Chapter Two

The Del Mod System came into existence in July 1971 as a prototype of an idea whose time was right - an idea in which institutions, agencies, industry and individuals would cooperate to improve and bring about a change in science instruction. Many factors - political, personal, and financial coalesced to create Del Mod and transform it into an operational entity.

To understand the problems encountered in making Del Mod function after its inception, the successes it had and the residual inpact it is expected to have, one must examine the events of the late sixties and early seventies in Delaware and Washington.

The systems approach to science education and the readiness to accept a cooperative working arrangement did not develop instantaneously as the result of a conference or meeting. A maturation period of about two years of trial and discussion between individuals was needed before any formal arrangement could take place. The seeds for evolvement of the Del Mod System appeared in 1968 in an unpublished paper by Uffelman and Purnell citing cooperative projects between the University of Delaware and the Department of Public Instruction. A subsequent study by Purnell in 1969 on The Status of Science Teaching in Delaware provided the needs assessment and background for later development.

Concurrent with these studies the Committee on Educational [illegible] of the Du Pont Company embarked on a program to support secondary education and in particular to upgrade the extent and quality of science teaching in Delaware. Heretofore, Du Pont financial aid in science had been limited to grants to institutions of higher education, specifically those which were heavily engaged in preparation of scientists and engineers.

In 1968, Delawareans elected Russell W. Peterson as their Governor. Governor Peterson had the distinction of holding a Ph. D. in Chemistry and had a life long interest in public education. He had served on numerous educational committees both in Delaware and nationally and was at the time of his election, a Director of Development for Du Pont. It is coincidental that from past association the Executive Secretary of the Du Pont Committee on Educational Aid and the State Science Supervisor were close personal friends of Governor Peterson. These relationships preceded Dr. Peterson's election as Governor and had considerable influence on the development of Del Mod.

The Delaware Technical and Community College was opened in 1967 as a two-year associate degree granting institution; thus, DTCC became the third institution of higher education to

be supported by public tax funds. The University of Delaware (1832) and Delaware State College (1891) were already receiving an appropriation from the State Legislature. To foster cooperation, prevent overlap, and discuss common problems, the presidents of the institutions voluntarily formed the Council of Presidents (1968). This represented the formal beginning of overtly recognized cooperation among the institutions of higher education yet insured that each retained its autonomy and own governance.

Outside of Delaware other factors were developing which contributed favorably to the establishment of Del Mod. The National Science Foundation assumed new leadership under Dr. William McElroy. Under his leadership the Educational Directorate had begun a series of studies to determine the impact summer institutes, academic year institutes, inservice institutes, curriculum development projects and other activities were having on the science learning process in the schools. The results showed about 10 percent utilization of NSF sponsored curriculum projects and shot-gun preparation of teachers to use these projects. A decision was made to place large amounts of money in discrete areas as an experiment to determine if utilization of curriculum packages could be increased, student learning improved, and the teachers better prepared to cope with the plethora of materials and methods on the market. A staff person was assigned the responsibility of implementing the idea.

Delaware - with its small geographic area, discrete population encompassing most segments of society, a science-education oriented Governor, close personal relationships between the principals involved, and an outside funding source for those aspects which could not be supported by NSF - was selected as a possible test site. A group was accordingly convened by the Governor to develop the proposal and the State Superintendent of Public Instruction was added to the Council of Presidents thus "augmenting" it - hence, the Augmented Council of Presidents (1970). Del Mod was funded and became an official project in July 1971. Over the years, Del Mod was to expend 2.8 million dollars.

From the outset of Del Mod, governance and control have been a problem. Were the project to be housed in any one institution or the project director to be on the existing staff of any institution - University of Delaware, Department of Public Instruction, Delaware State College, or Delaware Technical and Community College - the general feeling prevailed that effectiveness would be minimized. To circumvent the problem, the committee writing the proposal suggested the creation of a quasi-agency outside the physical and personal jurisdiction of any one institution. The University would be the fiscal agent for the project as trustee, the Director would be directly responsible to the Augmented Council of Presidents, the Director

and staff would be housed in space as neutral as possible and each institution would have a component coordinator for Del Mod affairs. For input from the field, a 31-member Advisory Committee was created comprised of chief school officers, principals, science supervisors, teachers, industrial representatives, representatives of the institutions of higher education and someone from the Governor's Committee on Science and Technology.

Fiscal control of the funds allotted to each institution and program control, so long as it was consistent with the Del Mod objectives, would reside with the component coordinator; the Director would be responsible for coordination of inter-institutional projects to reconcile agreement with the objectives, would have direct fiscal responsibility for the Director's office and programatic discretion over the projects assigned to the Director's office. In essence the Director was component coordinator like all other coordinators yet at the same time fiscally and programatically accountable for the entire project without the clout to make budget cuts, reconcile budgets, control programs, evaluate the effectiveness of institutional projects and Del Mod overall, or hire any personnel other than for the Director's office. All of these cumbersome protections of institutional prerogatives created an administrative nightmare for a Director who was held accountable but had no power other than persuasion to acutally manage the project. The consortium arrangement was possible because of the large amount of money involved.

Although fiscal management of the project was controllable by virtue of the University of Delaware accounting system, and proposed program was determined by the stipulations of the original proposal, far greater problems were encountered in evaluation efforts. At the time of Del Mod's creation NSF adopted the position that evaluation would be a pre- post- nature and the 1969 study, The Status of Science Teaching in Delaware would be duplicated at the close of Del Mod. Not spelled out or anticipated as a major problem was any requirement for formative evaluation, decisions on what would be included in future Del Mod proposals or who would evaluate Del Mod's impact on the institutions or the institutional impact on the schools.

The first evidence of this weakness appeared during the preparation of the Del Mod proposal for 1972-73. Who would decide what went into the proposal and who would make budget negotiations within Del Mod projects? The Director was faced with preparing a proposal within a given budget but had no authority or machanism to evaluate projects, make budget cuts or unify the projects into a total system. Each institution requested a lion's share of the Del Mod pie to further its own institutional objectives. The Director, likewise, requested funds to offer services directly to schools. Several plans were followed throughout Del Mod to work with this dilemma but none was ever

totally successful or satisfactory to all parties. The institutions continued to vie for their shares and more, and the Director was left without any impartial group to whom to submit the entire problem for arbitration. For several years the project officer for NSF became the neutral decision maker about budgets and the contents. In the final days of Del Mod a share of the budget was assigned to each institution and they submitted what they wanted to do up to the allotment. Their requests were honored with little question. The net effect of this weakness was that Del Mod became a sub-funding agency, the institutions cooperated because the sum of money involved was great enough to warrant cooperation and each group pursued its own path. The dream of all the forces working together for the common good of the whole was never realized as the original formers of the idea envisioned; yet in spite of the difficulties Del Mod became a powerful shaper of the science program in Delaware schools.

Not only did Del Mod influence the direction of science education but, to a lesser extent, the picture of mathematics education. At the creation of Del Mod only science as a discipline was considered. Several previously noted factors accounted for this but most important was the degree of organization among the science education community. The mathematics education group, although organized on the one hand, could not agree or compromise with the science education personnel on goals and directions. The task of mitigating their differences was too great for the time constraints of the initial project funding.

Shortly after the announcement of Del Mod's funding the Director realized that if the schism between mathematics and science were allowed to broaden, mathematics programs as an integral part of science programs and the inverse would not be possible. Steps were therefore taken to resolve the differences and bring mathematics under the Del Mod umbrella. Funding for Del Mod's second year included programs strictly for mathematics, a feat which the other NSF systems grants never did accomplish with their counterparts.

After several years of the budget reconciliation problem, NSF prevailed upon the Augmented Council of Presidents to create a group called the Coordinating Council for Teacher Education which was comprised of the institutional deans and an assistant superintendent of instruction for Department of Public Instruction. This group was charged with assisting the Director in Del Mod management and proposal formation. The one positive factor gained from this arrangement was the direct involvement of the Dean of the College of Education at the University of Delaware. Other than this individual, the others neither cared nor understood Del Mod's purpose and tended to delegate their responsibility to persons unable to make a decision for their institutions. Often the designee of a member of the CCTE was a component coordinator resulting in a situation in which an indi-

vidual for whom the Director was titularly and fiscally responsible was in actuality making decisions about the management of Del Mod. All of these factors made for a horrendous administrative muddle with nothing clear or distinct. The conclusion can be drawn that consortiums in the actual operation of a project in which each must give up some of his/her prerogatives and work toward a common goal simply do not consort unless an independent group comprised of members who can in no way benefit is present as an enforctment group.

If administration was a major Del Mod problem, evaluation was an even greater morass. Each institution was willing for internal evaluation of projects to take place on another consortium member or on the schools but was reluctant to permit internal evaluation of their own projects. About half way through the five year Del Mod life span, NSF changed the rules and required extensive internal evaluation rather than the originally proposed and accepted pre- post- design. No machinery had been set up for on-going collection of data, funds allotted nor adequate personnel on board to carry out the job. While the mandate to the Director's office existed to evaluate all projects internally and report on them, the actual desire to allow such internal evaluation to take place as well as the permission to conduct said evaluation was frequently thwarted or permitted to be only partially undertaken. The Director's office had no power other than persuasion to force compliance yet that office could exist as a scapegoat should it be convenient for a particular component or coordinator to so justify its actions. How then, with these administration and evaluative problems, was it possible for Del Mod to have achieved the success it had on servicing the schools? These successes have been frequently documented by several teams of outside observers and copious testimony given by the schools themselves as to the value of Del Mod. Only one answer appears to prevail - the careful meshing of the personalities of the individuals involved and the fact that during the outset of Del Mod most of the responsobility for service to the schools was concentrated in the Director's office. The Field Agent aspect of Del Mod and direct funding of local district projects was centered here. Del Mod's other powerful factor in school services, the Resource Centers, was a neutral thread common to all institutions and presented no threat to any faculty member (and even these have shown great variance).

An outside evaluation team once characterized Del Mod as an idiographic system. No description could ever be more apt. The dedication and desire of the Field Agents, Resource Center managers, the personnel of the Director's office and some institutional personnel accounted for the reputation Del Mod was privileged to enjoy. With the limited nomothetic qualities of Del Mod the latter statement seems the only acceptable one.

The personal operational philosophy of the Director likewise must be held as a contributing factor to the project's effectiveness. Faced with the administrative and evaluative shortcomings of the project the only logical course of action seemed one in which the Director adopted an attitude of working for and with all personnel associated with Del Mod and not burdening them with the internal politics. This policy coupled with the careful selection of personnel and outlining the parameters of their jobs to them without telling them how it should be done provided an independent climate in which they could operate. No employee except the Research Director was expected to shoulder administrative or evaluative responsibilities.

In order to open doors for Del Mod people and make a climate favorable for their reception, the Director early in Del Mod held a personal meeting with district personnel and non-public school people. In some cases these meetings resulted in the direct funding of local district projects; in others the promise to provide service. Nonetheless, the Director in the first year carried out the promise that every district would realize something from Del Mod. This promise was rigidly adhered to throughout the course of Del Mod. Again one must take into consideration that the Del Mod people were willing to go the extra mile to back up the Director.

In reviewing Del Mod, its problems and successes, one must consider that Del Mod was an experiment - an experiment to see if large sums of money could induce cooperation and enact a change in the quality of science and mathematics education children received. There were many problems some of which have been noted as guideposts to others who may try a similar tact for curriculum improvement. Other Del Mod problems were a result of change on the national scene at NSF and the economy which have affected the post-Del Mod commitments.

Delaware has not yet faced the after effects of a large project and the residual impact which has been made. There are some who say acceptance of federal funds to carry out a particular idea is bad since it leads people to a false sense of security and dependency. This is indeed true, but if federal funds are used with the direct idea that they are to accomplish a specific purpose rather than as a substitute for regular programs, much can be gained. History has shown us that when federal funding is withdrawn, the ongoing institutions do not tend to carry on the project but the teachers who have been impacted upon never return exactly to the point from which they started. The residual impact may be only 25 percent of that when a project was at its peak. Del Mod was well aware of this phenomena but the principals felt that 25 percent long term gain was worth the gamble.

Of late the question has been posed to the Director if it were to be done again would the Director have undertaken the job

if all the headaches and frustrations were foreseeable. Hindsight is always better than foresight but the answer has to be an emphatic "yes". In the eyes of the imparters and recipients Del Mod has been a success and well worth repeating. What of the cooperation which was extracted and held together by the Director's office? Will it go along when the entity known as Del Mod expires? The Department of Public Instruction has appointed a new state science supervisor who is not from Delaware and who has not had contact with Del Mod. Undoubtedly this individual's interest in furthering what Del Mod has started will be critical to future endeavors. This incongruency on the part of DPI reinforces earlier statements about the degree of commitment to a 2.8 million dollar project and causes one to conjecture about the esteem in which the DPI component held Del Mod.

Most of the Del Mod personnel, however, will remain in Delaware in different capacities. The teacher population is relatively stable and people do know each other. This web will not disappear, the Resource Centers will remain as a nucleus and it is anticipated that new relationships will develop, spawned by Del Mod but with different faces. This fact in itself will insure that the changes Del Mod brought about will not die but will remain in different forms.

Chapter Three

THE FINANCIAL STRUCTURE OF THE DEL MOD SYSTEM

John R. Bolig
Research Director

THE FINANCIAL STRUCTURE OF THE DEL MOD SYSTEM 1970-1976

Chapter Three

INTRODUCTION

The Del Mod Systems Approach to Science and Mathematics Education was conceived in the late 1960s, and implemented between 1970 and 1976 with funding primarily emanating from the National Science Foundation, the Du Pont Company, and the State of Delaware. Several smaller grants were also awarded by the Hercules Corporation and Crystal Trust. The use of these funds was restricted to the betterment of the science and mathematics education of Delaware teachers, and the amounts expended in the project totaled $2,875,077.00.

These funds were expended in three broad categories, administration, programs, and evaluation. The funds were spent by the four components and the Del Mod office itself. The University of Delaware served as the recipient, accountant, and disburser of all grant monies with the exception of funds allocated by the Delaware Legislature which were controlled by the Department of Public Instruction.

THE STRUCTURE OF DEL MOD

The components of the Del Mod System were the University of Delaware, Delaware State College, Delaware Technical and Community College, and the Department of Public Instruction. The presidents of these institutions governed Del Mod and determined all official policy.

In practice, financial policy was recommended by individuals in each insittution who were called component coordinators for the Del Mod System. These coordinators designed Del Mod programs and budgeted for anticipated costs. When the Council of Presidents received these budgets, they negotiated with the granting bodies and subsequently revised the budgets according to the amounts awarded.

DEL MOD ALLOCATIONS

Appendix A is a breakdown of the amounts of money awarded to Del Mod from 1970 to 1976. These awards closely follow the amounts projected prior to the inception of Del Mod, and reflect a sizeable impact on science and mathematics education within Delaware.

Appendix B is a breakdown of allocations to each component of the Del Mod System. This appendix is divided into a year by year breakdown and a summary of allocations.

The granting institutions were quite specific in their insistence that the majority of Del Mod funds be spent on the improvement of in-service science and mathematics teachers in Delaware, although some funds were earmarked for preservice teacher education at both the University of Delaware and at Delaware State College. For example, when Del Mod was begun, the NSF had already made a committment to Delaware State College for a preservice program in science education called UPSTEP. This program was continued and $86,889 of Del Mod's grants from 1972-1976 were tied to UPSTEP.

DEL MOD PROGRAMS

Despite the institutional nature of grant allocations, the Del Mod System was a coordinated effort to improve education. The components' coordinators met with the Del Mod Director once a month to plan and execute programs throughout Delaware.

Expenditures can be broadly classified as programmatic, administrative, and evaluative. Administration of Del Mod by its Director and its component coordinators cost $524,870 from 1970-1976. This equals 18.3% of the total budget.

Evaluation expenditures totalled $138,579, and represent 4.8% of the total budget. This percentage is relatively low for projects of this nature, and it has subjected Del Mod to criticism from several sources. In fact, the NSF insisted on keeping costs of evaluation down, and it has been the recipient of much of the afore mentioned criticism.

Programmatic expenditures totalled $2,211,628 which was 76.9% of the total allocations. This percentage is reputedly

high for projects of this nature. Del Mod had two major features which bear closer scrutiny.

The Field Agent Program. Field agents were master teachers employed by Del Mod to work across district lines throughout Delaware. These people were skilled in science or mathematics teaching techniques and served teachers in the state by conducting classes, workshops, institutes, in-service day programs, and on-site visitations.

The cost of the program was $357,842 (12.5% of the total budget). This figure includes only salaries and fringe benefits for the agents. Materials and supplies used by the agents were provided by the school districts or by the Del Mod resource centers described below.

The Resource Center Program. The second major feature of Del Mod was the three resource centers containing science and mathematics materials, kits, and supplies. These centers were located in the morthern (University of Delaware at Newark), central (Delaware State College in Dover), and southern (Delaware Technical and Community College in Georgetown) counties of Delaware.

The cost of the centers was $419,374 (14.6% of the total Del Mod budget). This figure includes all items within the centers and the salaries of personnel who operate them.

The Remaining Programs. In addition to field agent and resource center programs, there were many other Del Mod programs. The cost of these totalled $1,434,412 (49.9% of the total Del Mod allocations).

These programs included graduate and undergraduate college courses, local district curriculum and articulation projects, dissemination of Del Mod literature, inservice courses and workshops conducted by the Department of Public Instruction.

THE IMPACT OF DEL MOD

Exact numbers of participants in Del Mod projects are not known. For example, resource centers are open to any teacher in the state and no accurate count is undertaken. Field agents have many unrecorded contacts.

Extended contacts in courses, workshops, and in inservice programs have been recorded and as of May 1, 1976, these total 7484 teachers, 4011 of whom worked with field agents. It could be stated in dollars and cents as $295.51 being spent on each teacher, but the figure is inflated because of the unknown contacts mentioned above. The figure could be shown as an annual cost of $59.10 per teacher.

Another way of measuring Del Mod's impact is to consider the vacuum which would have existed without these funds. Most of Delaware's school districts have phased-out science and mathematics supervisors since 1970. The National Science Foundation and Du Pont have historically made grants to science and mathematics programs in Delaware, but never on the scale of those made to Del Mod.

Without these funds Delaware teachers would have had few or no alternatives to self-improvement in science and mathematics education. National Science Foundation funds traditionally awarded to Universities were confined to programs of a more or less exclusive nature. Teachers not qualified for graduate programs could not expect to enroll in these. The lack of district supervisors would have left only the two statewide supervisors at The Department of Public Instruction to conduct any and all inservice programs, and these with limited resources and time.

FISCAL POLICIES

The University of Delaware was the institution selected to receive all financial grants from the National Science Foundation, industry, and from various educational trusts. The reasons for this are partially based upon the convenience afforded to Del Mod, and partially based upon Delaware laws governing the receipt and expenditure of federal and private grants.

The component institutions of the Del Mod System were expected to follow financial policies of the University, and each was assigned account numbers for the various amounts of money to which they were entitled of Del Mod funds.

Del Mod employees were paid by their component institutions and the institution was reimbursed for that portion of the employee's time devoted to Del Mod activities. Employees assigned to the Del Mod Director's staff were all paid by the

University component. Travel, fringe benefits, materials and supplies were all handled in a like manner.

The Del Mod employees attached to the University had more latitude in travel expenditures than those in the public institutions of Delaware due to periodic spending freezes imposed by the Governor during times of economic stress, but this was the only shortcoming of the fiscal system governing Del Mod.

All expenditures were handled on either personal reimbursement forms or purchase orders, and all were subject to University audit.

In exchange for these services, the University was entitled to a small percentage of all grant receipts to cover overhead. In practice, overhead was never charged to the three other components of Del Mod.

COMMENTS

The fiscal policies of Del Mod are quite sound since they are not only governed by the University, but those funds disbursed to component institutions are in turn governed by those bodies.

The problem in analyzing Del Mod monies lies in the indeterminate nature of participants in Del Mod activities. Further compounding the analysis is the difficulty in determining how much was expended on science and how much on mathematics.

In its early years (1970-1972), Del Mod attempted to analyze cost effectiveness of programs by determining cost per man-hour devoted to each project. These data were used to eliminate some costly programs, but the problem of such decisions lies in making a choice between quality and quantity, and this type of computation was abandoned.

CONCLUSIONS

It has been shown that the State of Delaware was the recipient of $2.8 million dollars over a five year period for the improvement of science and mathematics education. Each of the component learning institutions was able to outfit resource centers for the use of inservice and preservice teachers, and other monies were made available to each com-

ponent for the employment of people and the development of educational programs for Delaware teachers.

Only a small fraction of these monies would have been otherwise available, and the extraordinary cooperation and coordination between four relatively autonomous institutions might not have occurred.

The greatest portion of these funds was poured directly into teacher betterment programs, and the employment of field agents empowered to cross district lines to work in all of the schools of Delaware created great efficiencies while benefitting all districts, especially those with no science or mathematics supervisors.

The creation of a central Del Mod office and staff served to coordinate all activities and to significantly reduce conflicts between component institutions. No one of these institutions was originally willing or able to coordinate activities, handle funds, or behave impartially on behalf of other components.

Finally, the experimental nature of The Del Mod System was a great incentive on the part of granting bodies to provide the large amounts of money Del Mod received. Many of these grants were complementary or for specific uses. For example, the National Science Foundation restricted some uses for their monies, but the DuPont funds were not similarly restricted. Thus, Del Mod could employ substitute teachers with DuPont money to cover for teachers who were enrolled in programs paid for with National Science Foundation funds. Also, other grants were earmarked for items such as videotape recorders for use by field agents. There was no other source for such items.

SOURCE AND AMOUNT OF FUNDS
ALLOCATED TO DEL MOD BY YEAR

	NSF	DuPont	Hercules	Crystal	State
1970-71	$ 24,500	$ 60,675	$	$	$
1971-72	390,812	163,275		2,700	
1972-73	591,162	129,350	1,000		
1973-74	482,352	112,135	1,000		
1974-75	400,182	86,550	1,000		15,000
1975-76	300,384	75,000			20,000
TOTALS	$2,189,392	$626,985	$3,000	$2,700	$35,000

TOTAL ALLOCATED: $2,857,077

DEL MOD ALLOCATION OF FUNDS BY COMPONENT
1970-1976

	NSF	DuPont	Hercules	Crystal	State
U of Del	$ 754,720	$312,075	$	$	$
Del State*	292,142	26,000			
Del Tech	260,739				
DPI	182,100	72,450			35,000
Del Mod Office	694,005	216,460	3,000	2,700	
TOTALS	$2,189,392	$626,985	$3,000	$2,700	$35,000

TOTAL ALLOCATED: $2,857,077

* In 1971-1972 NSF also granted $30,670 to Del State for the UPSTEP program.

	NSF	DuPont	Misc.
U of Del			
1970-1971	$ 24,500	$ 15,675	$
1971-1972	187,662	112,600	
1972-1973	160,297	20,500	
1973-1974	107,968	27,000	
1974-1975	176,213	68,800	
1975-1976	122,580	67,500	
	$779,220	$312,075	$
Del State			
1970-1971	$	$	$
1971-1972	11,903	10,000	(+ $30,670 for UPSTEP)
1972-1973	84,031	4,000	
1973-1974	80,000	4,000	
1974-1975	64,120	4,000	
1975-1976	52,088	4,000	
	$292,142	$ 26,000	$
Del Tech			
1970-1971	$.	$	$
1971-1972	63,941		
1972-1973	65,268		
1973-1974	61,918		
1974-1975	37,929		
1975-1976	31,683		
	$260,739	$	$
Del Mod			
1970-1971	$	$	$
1971-1972	118,106	40,675	2,700 Crystal
1972-1973	241,566	97,350	1,000 Hercules
1973-1974	180,861	69,435	1,000 Hercules
1974-1975	80,636	8,000	1,000 Hercules
1975-1976	54,022	1,000	
	$675,191	$216,460	$5,700

	NSF	DuPont	Misc.	
DPI				
1970-1971	$	$45,000	$	
1971-1972	9,200			
1972-1973	40,000	7,500		
1973-1974	51,605	11,700		
1974-1975	41,284	5,750	15,000	Legislature
1975-1976	40,011	2,500	20,000	Legislature
	$182,100	$72,450	$35,000	

Chapter Four

DEL MOD PROJECT DESCRIPTIONS
1970 - 1976

Compiled by

Sarah Richardson
Research Technician

Uldis Golts
Technical Writer

John R. Bolig
Research Director

DEL MOD PROJECT DESCRIPTIONS

Chapter Four

Between 1970 and 1976, Del Mod conducted 208 separately funded projects ranging in duration from one day to one year. Each is briefly described on the following pages. Records of participation have been kept for each project since participation was frequently related to inservice or college credit awarded to teachers. These records as well as larger project reports will be filed at the University of Delaware upon Del Mod's conclusion.

The projects described on the following pages are preceeded by numbers such as 70-01 which refers to the fiscal year in which the project was conducted as well as the sequence of the project in that year. These numbers were used for Del Mod record keeping purposes.

70-01 A Study of Field Agent Approach
Director: John Reiher
Field Agent Project
65 Participants

This project, conducted during the academic year 1970-71, preceded the formal inception of Del Mod. One objective of this pilot project was to develop a prototype for Del Mod's field agent concept. All but a few of the Kent and Sussex County science teachers participated in this project. They were divided into six groups and met one full day every other week for fifteen weeks. The course consisted of mini-lessons from many of the newer science curricula, the use of micro-teaching, field trips, lectures, workshops and the development of teaching units. In addition, a training workshop was instituted for the substitute teachers who were assigned to cover the classes of the participants. The program details were developed by the field agent and the State science supervisor. The State science supervisor assumed responsibility for all arrangements with the schools.

Pre- and post-TOUS tests indicated that this field agent program seemed to have had no significant effect on the participants' attitudes. It does, however, seem evident that the participants have changed in their attitudes toward ordering textbooks and classroom supplies. From this initial venture several points emerged that served to guide future Del Mod field agent programs. Thus, it was found that cooperation will occur when teachers are given release time and the districts are provided with remuneration for substitutes. It was also found that effective group sessions must be small and that extensive use should be made of microteaching techniques and interaction analysis. Materials should be inexpensive, easily transported, and adaptable to most classroom situations. Field agents should alternate their pattern of presentation to avoid fatiguing their audience. To reinforce and insure implementation of the skills perfected in group sessions, follow-up activities are strongly recommended.

The National Science Foundation provided funds for the operational costs of this pilot program, and the DuPont Company supported the substitutes for teacher replacement.

71-01 Physical Science 1971 Summer Project
Director: Seymour Yolles
University of Delaware Project
30 Participants

Dr. Yolles directed thirty secondary school teachers of physical science in a program devoted to the upgrading of chemistry, physics, and related math skills. These teachers from eleven school districts attended two or three courses for six weeks, six hours per week.

71-02 Population-Environment Curriculum Study
Directors: Robert Stegner and Val Arnsdorf
University of Delaware Project
30 Participants

Thirty teachers from six districts and two private schools worked four hours a day for six weeks to produce a K-12 program in population environment studies. The teachers were from various subject matter areas in the curriculum. There were social studies, art math and language teachers participating. Twenty-four packets of instructional lesson plans were produced.

71-03 Marine Environment Curriculum Study
Director: James S. Schweitzer
University of Delaware Project
18 Participants

James Schweitzer, Robert Stegner, and Maura Geens taught sections of this project (which is also Project 71-06), involving forty-seven teachers in seventeen districts. The goals were to establish a multi-disciplinary K-12 program of marine and wetlands environment studies and to train and encourage teachers in the implementation of this program. Forty-seven packets of instructional materials have been produced.

71-04 Auto-tutorial Project
Director: Catherine Y. Bonney
Local District Project
12 Participants

This Newark district project with Catherine Bonney and Susan Hartzler involved twenty-one teachers in the development

of auto-tutorial science units and learning centers (K-12). These units were structured around measurable performance objectives. Teachers were trained in the methods of preparation and meaningful classroom use of auto-tutorial units.

71-05 Wilmington Middle School Science Teacher Project
Director: Loretto Clark
Field Agent Project
15 Participants

Loretto Clark served as a part-time non-resident field agent for fifteen middle school science teachers in the four middle schools in Wilmington. The program involved all day classroom visitations with each teacher (one per month) and Saturday meetings with the entire group. Work included orientation and use of SAPA, ISCS, EES, and IPS curricular materials.

71-06 See Project 71-03.

71-07 Upper Elementary - Kent and Sussex Counties
Director: James Gussett
Field Agent Project
60 Participants

Mr. Gussett worked with elementary teachers in grades four, five, and six in Kent and Sussex Counties. The field agent provided in-the-classroom assistance to help teachers overcome their reluctance to teach science. Activities in EES, IME, IPS, SAPA, and other science curricula were demonstrated to the teachers. Field trips and visits to the Del Tech Resource Center were included.

71-08 Eastern New Castle County Teacher Project
Director: Barbara Logan
Field Agent Project
60 Participants

The field agent acted as a consultant, evaluator of curricular materials, demonstrator of classroom teaching activities, and all-around morale booster to teachers from grades five through nine. Included in this project was classroom observation for diagnosis of teaching strategies. This involved video-taping

of individual teaching techniques. Also the field agent conducted group in-service instruction for the purpose of improving teaching skills.

71-09 Science/Mathematics Workshop
Director: John Reiher
Department of Public Instruction Project
32 Participants

John Reiher, William Geppert, and Mrs. Patricia McBath conducted four two-hour sessions with thirty-two K-3 elementary teachers and supervisors in Kent County districts. The instruction was to help teachers to use activity-centered science lessons to support the open-classroom approach.

71-10 Evening Laboratory Program
Director: Wilfred Miller
Local District Project
3 Participants

A program with Mr. Miller was conducted in the Alfred I. duPont School District to encourage students to develop science projects of particular interest to them. These projects were worked on by seventeen to twenty students over a span of seven months. Students' projects included tissue culture, photomicrography, hydroponics, and rabbit antibodies.

71-11 Primary Science In-service - Ecology
Director: Janet Johnson
Department of Public Instruction Project
24 Participants

Ms. Johnson, John Reiher, State Supervisor of Science and Environmental Education, and three professionals from the New Castle-Gunning Bedford District conducted six in-service training sessions for twenty-four primary school teachers, grades K-4. This experience was provided to increase the teachers' awareness of ecological problems. Teachers used the materials in the ecology section of the SCIS curriculum.

71-12 Focus Program
Director: James T. Delaney
Local District Project
11 Participants

Mr. Delaney, principal of St. Mark's High School, directed a program of extensive multidisciplinary instruction for the underachieving student. Using a team of fifteen teachers, the program devoted its attention to twenty "slow learners". The aim was to alter their negative attitudes toward school by individual attention and by fostering success in their studies.

71-13 Model for Articulation
Director: John Jenny
Local District Project
12 Participants

Twelve teachers met with Dr. Jenny to unify the science curricula of the two Stanton School District junior high schools and to make a transition from the elementary SAPA program to the junior high school's programs effective for the students.

71-14 Environmental Education
Director: Thomas Hounsell
Local District Project
43 Participants

Under Thomas Hounsell's leadership this project involved forty-three teachers in grades K-4 and seventh grade in the Alexis I. duPont School District. The work was directed toward providing in-service training in ways to include population environment-related concepts and materials into the existing program. As a result of Del Mod support, 750 activities were written, a subject matter specialist in the area of astronomy and planetarium science was hired, and a marine biology enrichment program was instituted.

71-15 Physical Science In-service Project
Director: Seymour Yolles
University of Delaware Project, ED 505
23 Participants

This inservice project focused on the improvement of physical science teaching. These New Castle County teachers elected one graduate course each semester from a number of choices, including organic chemistry and educational research procedures. They also participated in a seminar course in which they designed secondary school laboratory activities and discussed common problems of science education.

71-16 Madison Project - Elementary Mathematics Program
Director: John A. Brown
Department of Public Instruction/University Project
43 Participants

Elementary or middle school teachers from six northern Delaware districts participated in this project. The program was designed to acquaint the teachers with activity-centered mathematics classes by providing experiences with the instructional materials as developed by Madison Math.

71-17 Primary School Teachers - Science/Mathematics Workshop
Directors: John Reiher and William Geppert
Department of Public Instruction Project
30 Participants

The intent and focus of this project was the same as that of Project 71-09. Teachers from the Marshallton-McKean School District in grades K-3 attended this inservice day to be helped in their development of science and mathematics lessons that were correlated and activity-centered.

71-18 Junior High/Middle School Science Teachers Follow-up Program
Director: Albert Burkhardt, Jr.
Del Mod Project
49 Participants

After the 1970-71 Del Mod field agent program in Kent and Sussex Counties, John Reiher and other part-time professionals provided in-classroom assistance to teachers. This project

reinforced the activities presented in the 1970-71 field agent program and also allowed teachers to improve their teaching techniques through analysis of micro-teaching video tapes.

71-19 Physical Science for Primary Teachers
Director: Winston Cleland
Local District Project
17 Participants

Mr. Cleland worked with seventeen elementary teachers from the Marshallton-McKean School District. The work was directed toward increasing the physical science content background of the teachers so as to increase the effectiveness of the AAAS science program. Using self-teaching modules in the physical sciences, the teachers were able to increase significantly their cognitive performance scores on a post-test.

71-20 Individual Teacher Program
Director: Dale Reynard
Individual Teacher Project
1 Participant

Mr. Reynard produced nine computer programs for student-derived data in CHEMS. This enabled students who have access to the Project Delta Computer to quickly analyze laboratory information. They obtained this data by performing certain laboratory explorations in the CHEMS curriculum.

71-21 Individual Teacher Program
Director: Winston Cleland
Individual Teacher Project
1 Participant

Mr. Cleland's project was the development of modules for instruction of elementary teachers in the concepts of physical science. These modules consisted of activities, resources, and tests for each of the modules. The use of the modules has been previously described in Del Mod Project 71-19. This field testing is complete and the materials are ready to be distributed.

71-22 Spring Marine Curriculum Study
Director: Maura Geens
University of Delaware Project
20 Participants

In a continuation of Del Mod Projects 71-03 and 71-06, Dr. Geens offered a course in marine environment studies for teachers in Milford. This course provided training for teachers in the production of teaching resource packets. These packets included detailed lesson plans of the conventional type, background materials for the teachers, and some packets were resource collections for extended units or chapter studies.

71-23 Leadership Training
Director: Robert Uffelman
University of Delaware Project
13 Participants

This inservice program under the direction of Dr. Uffelman and Bruce Watt was designed to prepare experienced teachers tc work as inservice instructors and master teachers. Thirteen middle or junior high school teachers who were participating in Del Mod Field Agent Projects worked three hours per week for fifteen weeks. These teachers prepared auto-tutorial science education materials. Mr. Watt worked with video-taping in the analysis of teaching strategies.

71-24 UPSTEP
Director: Columbus Ricks
Delaware State College Project
9 Participants

Dr. Ricks conducted a program of training in the new physical science curricula ISCS and SCIS. This training was provided for pre-service teachers of grades five through eight. In this program the pre-service teachers had practical experiences in classrooms in several public schools under the guidance of experienced teachers.

71-25 Physical Science Inservice Project
Director: Seymour Yolles
University of Delaware Project
21 Participants

Dr. Yolles directed secondary school teachers of the junior high and middle school levels in a program devoted to the improvement of physical science teachers. This is the second semester continuation of Del Mod Project 71-15.

72-01 Math/Science Behavioral Objectives Workshop
Directors: John Reiher and William Geppert
Department of Public Instruction Project
77 Participants

During the summer of 1972, two workshops were developed for 76 science, mathematics, and career education teachers in the middle or junior high school level. One workshop was held at Del Mod Resource Center at Delaware Technical and Community College in Georgetown for teachers in Kent and Sussex Counties; the other was held at the Del Mod Resource Center at the University of Delaware. The major thrust of each workshop was an orientation to the development and use of behavioral objectives in the teaching situation. The training manual for behavior objectives as developed by a United States Office of Education grant was used for the workshop and each participant developed a teaching activity which they could use in the beginning of the school year.

The workshop was used as a training session in behavioral objectives which was the first phase of workshops. These continued in Cape Henlopen School District for elementary and secondary; Capital School District for middle and senior high school (see Project 72-24); Stanton School District for junior high school; and Claymont School District for middle school.

In the self-evaluation of the workshop the participants felt the workshop was worthwhile in that they got a clearer understanding of behavioral objectives and how they can be used.

72-02 Inventory and Program Assessment, Odessa and Townsend Elementary Schools
Director: Audrey Conaway
Field Agent Program
15 Participants

In this project, inservice teachers took complete inventory of available science materials at the Odessa and Townsend Elementary Schools in the Appoquinimink school district. The resulting inventory lists indicated the location of all items and the grade level for which they were suited. The lists enabled teachers to share and utilize more efficiently the science resources of their schools.

72-03 Development of Middle School Program, Wilmington School District
Director: Frances Barhydt
Local District Project
15 Participants

Mrs. Barhydt conducted a summer workshop at the P.S. duPont High School for middle school teachers. The workshop was conceived as an interdisciplinary science program. The participants constructed their own objectives for the workshop, as follows: 1) to develop techniques to instill motivation in their students; 2) to integrate subject matter; 3) to develop a reasource list; 4) to prepare equipment and lesson plans; 5) to discuss types of student contracts for classroom use; 6) to develop procedures for coordination within a team and between middle schools; 7) to work on setting up stations so that classrooms can be opened with structure.

With the assistance of discussion, lectures, demonstrations, speakers, lab sessions, constructed models of science concepts, and a visit to the Delaware Museum of Natural History, the teachers attempted to put their curricula into a more workable conceptual framework.

72-04 Articulated Program for Wilmington Grade Schools
Director: Walter Knighton
Local District Project
13 Participants

A group of elementary teachers met with a consultant, looked

at the current district program and developed a plan for articulation of that program into a conceptual scheme. During the school year further discussions were held with the intent to implement the plan during 1973-74.

72-05 Physical Science (IAC) Program for Wilmington Secondary Teachers
Director: Wilmer Cooksey
Local District Project
6 Participants

A six-week summer program was carried out to introduce chemistry and physics teachers to materials suitable to students of different learning levels. With district funds and additional monies from the duPont Company, materials were purchased and the program put into effect during 1972-73. As a result test scores improved, there were less discipline problems, there was greater material retention than in previous years, and many students requested a second year of chemistry. Next year's enrollment in chemistry has increased by 30 percent.

72-06 Curriculum Development for the Indian River School District
Director: Ralph Mahan
Local District Project
16 Participants

Prior to 1972, no guidelines for an articulated science program existed in this newly consolidated district. As a result of a year of work, the participants produced minimal curricular guidelines for grades 7-12.

72-07 Environmental Lab Workshop
Director: Hess Wilson
Local District Project
23 Participants

An implementation program for ESS, SCIS, and SAPA was carried out by providing in the classroom assistance in the New Castle-Gunning Bedford School District. By using a local resource person an improved interchange of ideas among schools and better efforts to coordinate programs were also achieved.

72-08 Followup of Project 70-01 for Capital School District
Director: Mitchell Gordon
Local District Project
10 Participants

This project involved a one week training session on "Performance/Behavioral Objectives" for middle school science. The goals were to provide basic behavioral objectives for the Capital District middle school science curriculum, and to develop teaching strategies, instructional activities, and assessments for those objectives.

72-09 Development and Implementation of Auto-Tutorial Units, Newark School District
Director: Susan Hartzler
Local District Project
14 Participants

As a continuation of the 1971 program, auto-tutorial units were produced, expanding the count to 33. A parttime field agent assisted throughout the year on the implementation phase of auto-tutorial materials. As a result, greater communication was achieved among district schools and tremendous program diversity was noted. The units were also made available to other districts through the resource centers.

72-10 Introduction of Math Lab
Directors: John Reiher and William Geppert
University of Delaware Project
83 Participants

This program was designed for those teachers who needed an introduction to the Math Lab as described in Project 72-15.

72-11 Adaptation of Individualized Math/Science Computer Programs
Director: James Aliquo
Local District Project
7 Participants

An IPI program for high school physics and algebra based on the DeWitt High School model was developed and tested this year in the Marshallton-McKean School District. As a result of the initial implementation without computer time, teachers became aware of the possibilities of IPI. It was also learned that for an IPI program

to be effective, awareness of the possibilities and the need for total cooperation are essential.

72-12 Development of Science Curriculum Guide
Director: Robert Martin
Individual Teacher Project
9 Participants

This project began with nine participants, but never got off the ground. Because none of the grant money was spent, it reverted to the Del Mod General Fund.

72-13 K-12 Behavioral Objectives for Seaford School District Science Program
Director: Arthur W. Ellis
Local District Project
10 Participants

A conceptual curriculum guide for K-9 was developed for use by the science teachers. The emphasis was placed on what should be taught rather than how material should be taught. Since no guide was available before, this also served as a coordinating vehicle.

72-14 Developing Modules for Junior High School Science Teachers
Director: Dr. Robert Uffelman
University of Delaware Project
5 Participants

This activity was part of Dr. Uffelman's Leadership Training Project. From this project the Test of Inquiry Skills, a test of science process designed for group measurement, was developed and is undergoing evaluation and revision.

A revised form has been used in five school districts to assess both teachers and students. The inquiry modules served as models for teachers to follow in developing their own for use in their classrooms. The physical science modules were used as trial materials for undergraduate courses and will be introduced by field agents during 1973-74.

72-15 Math Lab
Director: Verena Sharkey
University of Delaware Project
10 Participants

This project, as well as projects 72-29 and 72-33 were continuations of the Madison Math Project (see project 71-16). Teachers taking these field workshops (University Course ED559) learned how to use manipulatives and activities in the classroom. They were familiarized with activity cards, books, and other publications concerning the math lab. They also learned hwo to construct inexpensive materials for use in their classrooms. This project utilized the concept of centers strategically located throughout the State in various schools. The program at each center was conducted by a competent teacher with the guidance of one University instructor.

When asked to make an evaluation of the course, 90 percent of the participants responded that the course had changed their classroom behavior in a positive manner. They also sensed a positive increase in their students' attitudes toward mathematics as a result of their increased use of manipulative aids.

72-16 Physical Science Workshop for Elementary School Teachers
Directors: John Reiher and Winston Cleland
Local District Project
37 Participants

The directors conducted this workshop for elementary science teachers. The focus was on methods of teaching science, discussion of content, and the development of pertinent learning materials.

From this project, Dr. Cleland wrote three papers on the teaching of physical science in the elementary school: "The Development of a Performance Based and Individualized Newtonian Mechanics Instructional Module to Provide Content Background for Elementary School Teachers", presented to the Association for the Education of Teachers in Science at Columbia University, October 26, 1973; "Designing a Model for Developing Learning Materials that Provide Elementary Teachers with Content Background in Science in an Inservice Workshop Format", presented to the National Science Teachers' Association, Chicago, March 17, 1974; and "A Possible Model for Developing Performance Based Inservice Modules that Provide Elementary Teachers with Content Background in Science: An Application of the Model", presented to the National Association for Research in Science Teaching, Chicago, April 18, 1974.

72-17 Implementation of IIS, IPS, and ISCS
Director: John C. Cairns
Local District Project
8 Participants

The purpose of this workshop was for teachers in the Capital School District to become acquainted with the newly adopted IIS, ISCS, and IPS programs. The project was conducted as a series of inservice workshops; two days were held in the summer, and four Saturday morning sessions took place in September and October to discuss the progress of each program.

These teachers were involved in evaluating the implementation of the ISCS and IPS programs. The consensus of the outcome of this project is that teachers needed to spend less time on discipline, and were able to devote more time working with students in the classroom.

Implementing the ISCS program gave the staff the opportunity to test the effect of the ISCS Program on the reading level of ninth grade students through pre- and post-tests. The effect of the discussion meetings with the participating teachers was that through an exchange of ideas, the teachers became more disciplined in their approach to teaching the ISCS Program.

72-18 Upper Elementary School Field Agent Activities
Director: James Gussett
Field Agent Project
59 Participants

The general thrust of this program was to "sell science", and to assist upper elementary teachers to achieve some success with a discipline and science attitude in which they did not feel comfortable.

All participation in the inservice sessions was voluntary, and the number of formal group sessions varied from district to district. The maximum was 15, the minimum was 10. This did not include individual work with teachers in their classrooms, which was considerable. Head count seems to indicate that teachers have found a program of which they want to become a part. The unsolicitated verbal feedback from these teachers is such that they believe they are obtaining something of teaching value; something that will assist their effectiveness.

In an attempt to determine the direction and change necessary for individual teachers and groups, a pre- and post-assessment type approach to the field agent activities was used in assessing competence in their skills and attitudes. It should be noted that often classroom observations by the agent did not conform with all teacher replies to the assessment, so adjustments were made in the prescription for improvement.

72-19 Physical Science Institute for Middle School Teachers
Director: Columbus Ricks
Delaware State College Project
26 Participants

The Physical Science Institute was designed largely for middle school/junior high school teachers. It consisted largely of giving the teachers a review of the content which was relevant to the ISCS and SCIS programs. Immediate needs of their present classroom experiences in individualized laboratory instruction and the underlying philosophy of ISCS, SCIS, and others were all part of the program. Outside lecturers were brought in; for these occasions undergraduates in UPSTEP and elementary education were invited to attend. The significant part of the program was the lending facet which enabled teachers to use in the classroom the activities to which they were exposed. Follow-up service was provided by the institute director.

72-20 Developing Performance Objectives for Upper-Elementary School Teachers
Director: Darlene Bolig
Local District Project
11 Participants

With the aid of a Del Mod Field Agent and the Caesar Rodney District elementary supervisor, teachers developed minimum performance standards for grades 4, 5, and 6 based on the existing district program. The side benefit of improved intradistrict communication was also achieved.

72-21 Study Based on TOUS Scores and 14 Scale Video Analyses (Hi-Pri Study)
Director: Bruce Watt
Field Agent Project
26 Participants

Del Mod Research Director John Bolig and Field Agent Bruce Watt undertook a research study to determine if any correlation could be derived between scores on the TOUS test and the input of student activity, recorded by the 14 category Instrument for Analysis of Science Teaching from the University of Texas. Interaction data were obtained from video tapes and live classroom episodes. The study found that student non-verbal activity was much more in evidence in the classes of teachers with high TOUS scores. It seems probable that teachers with greater knowledge of science, as measured by the TOUS, permit more latitude on the part of students. This would be a desirable characteristic in school districts which have adopted inquiry-oriented curricula.

72-22 Doctoral Study of Characteristics of Delaware Science Teachers, Temple University
Director: Dr. John Michalcewiz
Individual Teacher Project
45 Participants

This study yielded Dissertation: A Study to Determine if Selected Teacher Variables are Related to Direct and Indirect Teacher Influence in the Classroom, Temple University. The interaction of Delaware science teachers with their students, comparison of the results with assessments of the teachers' scores on the Test of Understanding Science (TOUS) were examined for relationships. Del Mod videotaped 60 teachers for this study and tested all of them. The analysis of the data was jointly planned and undertaken by the doctoral candidate and the research director.

72-23 Middle School Field Agent Activities, New Castle County
Director: Barbara Logan
Field Agent Project
25 Participants

Each year teachers are recruited or are recommended to participate in seminars with Del Mod field agents. In 1972-73, twenty-five teachers participated in fourteen bi-weekly seminars

during which they were systematically introduced to the newer science curricula in science education, to the methodologies these curricula utilize, and to the research from which they developed.

A survey of teaching strategies (Uffelman, 1972) was used as a pre-and post-self assessment. Teachers were asked to judge the performance as being essential or non-essential to successful science teaching and to appraise their own performance to meet requirements stated in the objectives. Post assessments in both cases showed appreciable gains.

An effort was made to assist teachers in developing and/or improving specific performances. Teacher-constructed tests were examined and the questions were classified as to their degree of difficulty using Bloom's Taxonomy as a criterion. Some time was also devoted to instructional planning with particular emphasis on the relationship among the stated objectives, the activities suggested, and the evaluation items designed.

In addition to completing a programmed unit, Constructing Instruction Based on Behavioral Objectives, each participant was asked to prepare a unit that could be used the next term. The units submitted were critiqued by this field agent with special attention given to the three areas: the statement of objectives; the appropriateness and the relevance of the assessment items. Subjective evidence of the effect of the seminars was observed. One school invested in SCIS materials for use the next year. Two schools dusted off retired SAPA materials and requested that their budget be spent to supply missing items.

Materials were checked out of the resource center on a regular basis indicating a tendency to include more student centered activities in the curriculum. Four schools, whose teachers were involved in the seminars, ordered ESS materials to supplement ongoing programs after using these materials from the center.

72-24 Followup of Project 72-01 for Capital School District
High School Science
Director: John Cairns
Local District Project
3 Participants

Using the structure of the 72-01 project, these teachers, John Cairns, Frank Luxl, and John Layton, set down the behavioral

objectives of three areas of study. The three programs for which this was done were Algebra I, the IPS curriculum, and Vocational Chemistry. For each objective, the means of achieving it were listed, providing a comprehensive set of behavioral objectives.

72-25 UPSTEP Program, Delaware State College
Director: Columbus Ricks
Delaware State College Project
13 Participants

The UPSTEP program has been designed to prepare pre-service students to teach science at the middle school/junior high school level. This program has now completed its third year and students from the UPSTEP program began student teaching in September, 1973. In addition to the lexicon of basic courses necessary for the bachelor's degree, requirements for certification of students enrolled in UPSTEP are required. Throughout the past year several of the UPSTEP students worked with field agents in the schools as observers and recipients in special situations.

72-26 Environmental Education Program for Fourth and Fifth Grade Teachers
Director: Mike Riska
Local District Project
38 Participants

In conjunction with the Delaware Nature Education Center, a program for environmental awareness was carried out for all fourth and fifth grade teachers in the Wilmington School District. This included use of school yard as a site, field trips for teachers, and seminars on population/environmental education.

72-27 Followup of Gussett's 1971-72 Field Agent Program
Director: James Gussett
Field Agent Project
26 Participants

This project (for Sussex County teachers) and Project 72-18 (for Kent County teachers) constitute a continuation of Del Mod Project 71-07.

72-28 Developing Grade Nine Activity Mathematics/Science Program, Capital School District
Directors: John Cairns and James Trent
Local District Project
8 Participants

In an effort to facilitate the curriculum changes, this project was created to develop supplementary mathematics and science activities. The program developed was an outgrowth of the activities in Project 72-17.

72-29 Math Lab I
Director: Verena Sharkey
University of Delaware Project
220 Participants

This project, a continuation of the Madison Math Project (see project 71-16), consisted of an inservice program with seven classes located in the three counties of Delaware. Mrs. Sharkey coordinated the seven groups of the course, taught by Ralph Mahan, Neil Walzl, Peter Shannon, William Geppert, Charles Eisenbise, John A. Brown, and A. McPherson. Del Mod Project 72-33 is a continuation of this project.

72-30 Math for Science Teachers (M557)
Directors: Willard Baxter and T.J. Kearns
University of Delaware Project
9 Participants

This course was an attempt to give science teachers mathematical skills needed when teaching such programs as IPS, ESCP, and BSCS. Such skills included probability, statistics, and algebra. Four specific goals were:

1. Introduction to the jargon of modern math;
2. Better understanding of functions;
3. Better understanding of the relationship of math to science;
4. Increased familiarity with many mathematical concepts.

The project was suggested by the Del Mod Research Director, based on his findings that the mathematics background of science teachers was insufficient to teach the mathematics inherent in the new junior high school science program. As an outcome of this project, the University's Department of Mathematics plans to evaluate the practicality of a series of short courses on topics developed in this project.

72-31 Environmental Chemistry Course
Director: Dr. Wayne Anderson
University of Delaware Project
14 Participants

In order to provide teachers with curricular ideas for non-science majors, the University offered a course in Environmental and Consumer Chemistry. The course was designed to give science teachers sufficient background in this area so that they could design a course for use in their own classrooms or could include environmental topics as part of a traditional chemistry course. An important objective of the course was to improve the overall background knowledge of the teacher. Topics covered in this course included toxic metals, food additives, cosmetics, pollution, nuclear power, alternative sources of energy, pesticides, and sewage treatment. Lectures were prepared by two University faculty memebers.

The participants gave the program a generally favorable evaluation, although a few individuals felt that the material was not directly applicable to the classroom.

72-32 Followup of Dr. Seymour Yolles Physical Science Interns (ED808)
Director: Robert Uffelman
University of Delaware Project
4 Participants

This project is a continuation of Project 72-14 and part of the Leadership Training Project. The participants field-tested Inquiry Skills Modules that had been developed in Project 72-14. Also, a new form for fifth grade students was tested.

72-33 Followup of Math Lab Project 72-29 (Math Lab II)
Directors: John Brown and Neil Walzl
University of Delaware Project
21 Participants

The objective was to develop materials and activities that could be used profitably in inservice courses for elementary and middle school teachers of mathematics. Since this project was a continuation of the Madison Math Project, see Projects 72-15 and 72-29 for more details.

72-34 Followup of Dr. Seymour Yolles Project 71-15, Organic Chemistry for Teachers
Directors: Wayne Anderson and James Moore
University of Delaware Project
5 Participants

The project, a follow-up of project 71-15, consisted of a basic organic chemistry course for teachers.

72-35 Elementary School Field Agent Activities
Director: Audrey Conaway
Field Agent Project
40 Participants

The objective of this project is to provide teachers in the lower grades with a science guideline which they can amend and adjust to their own concept of importance and needs. This project was offered to districts using the SAPA Program as a vehicle for articulation. The teachers' feeling of inadequacy and lack of confidence in science made them resistant to new programs. SAPA presented an enigma to most of the participants, since most workshops had tended to put the teacher in the position of the student, but had neglected to prepare the teacher for the role of classroom manager. In many instances, the field agent had to spend considerable time untangling the disorder of abused SAPA kits, setting up a central storage system convenient for sharing, taking inventory of missing parts, and in a few cases just tracking down materials which had been stored away. The field agent demonstrated in the classroom materials borrowed from the Del Mod Resource Center. Teachers were amazed at how diversified science is and how it could be correlated with reading, arithmetic, etc.

These sessions inspired the teachers to expand the science program and to experiment with their own ideas and units. The field agent originated several local interest units which caused teacher enthusiasm. An EMR class became so interested in beach environment through a field agent unit on horseshoe crabs that a field trip was made to the beach to participate in The Sea Beside Us, an ESEA Title III program.

The field agent assistance was welcomed by the primary teachers since it relieved some of their concerns and fears about science. The participants were informed of new programs and ideas and were kept in contact with resource centers. Many teachers stated that they had learned to enjoy teaching science.

72-36 Field Agent Videotaping Program
Director: Bruce Watt
Field Agent Project
25 Participants

The participating teachers had volunteered to undergo self-analysis through the use of video taping. The premise underlying this program was that by the use of video taping and interaction analysis, secondary teachers could become more aware of their teaching styles and techniques. This would serve to reinforce the desirable traits and serve as an agent to promote change in less desirable traits. Bruce Watt's monograph Your Verbal Portrait, was the central theme of the playback conference. Following the objective analysis, a general discussion about the video tape was held. During the discussion positive reinforcement was emphasized.

Although teachers generally agree that video taping and analysis is a worthwhile enterprise after the fact is accomplished, the majority of teachers will refuse to volunteer in such a program when it is an end in itself. When videotaping is an integral part of an ongoing program and the teacher has confidence that the reviewer will not reveal the tape analysis to administrators, peers, or other unauthorized persons, it does work and is extremely effective.

72-37 Coastal Studies Program, Adaptation of Dr. Kraft's Work
Director: Robert Lewis
University of Delaware Project
34 Participants

Mr. Lewis, a teacher, worked with University of Delaware geologist J.C. Kraft in constructing an activity-oriented teachers' manual to be used with Dr. Kraft's recent publication A Guide to the Geology of Delaware's Coastal Environment. Twelve lessons were developed, together with field trip information, maps, glossary, tests, audio-visual aids, and references. The lessons suggest an approach for using the Guide in earth science classrooms and field studies. Inservice credit symposia based on Kraft's Guide and Lewis' Manual were offered through the Department of Public Instruction to earth science teachers of Kent and Sussex Counties in the fall of 1972 and to New Castle County teachers in the spring of 1973.

With certain modifications based on feedback provided by teachers to Mr. Lewis, the spring lectures were taped and trans-

cribed and slides copied for deposit in Del Mod Resource Centers. This project also supplied information about the feasibility of offering inservice symposia for teachers.

72-38 Field Agent Activities (AAAS, Environmental Education Program)
Director: Dennis Reilly
Local District Project
27 Participants

A parttime field agent worked with upper-elementary teachers from the Alfred I. duPont School District to assist them in developing their school site for incorporation of environmental evaluation activities into the regular SAPA science program. Additional materials were purchased and considerable parental help was used to carry out the program. Of the group, 15 teachers in five schools plan to continue on their own during 1973-74 to sharpen the work done last year.

72-39 Longitudinal Study of Several of Logan's Field Agent Participants
Director: Bruce Watt
Field Agent Project
11 Participants

The object of this research project was to determine whether Field Agent inservice programs effect changes in the teaching styles and techniques of the participating teachers. Fifty teachers were videotaped during the 1971-72 school year. These teachers participated in Field Agent Barbara Logan's inservice program during the spring of 1972. Eleven of those teachers were videotaped again following the inservice program. The teachers knew in advance the time and day the tapes were to be made, but were given no directions as to what they were expected to teach during the taping experience. Field Agent Bruce Watt analyzed the tapes using Flanders' ten-category system of interaction analysis. A computer program was utilized to expedite the analysis of data. Mr. Watt found the Flanders' analysis inadequate for recording interactions in a lab-oriented class. He arbitrarily decided to record class interaction as "lab activity" whenever the teacher's voice was not distinguishable. Using this operational definition it was found that the eleven teachers have their students involved in more lab activities this year than last. A somewhat surprising finding was that the use of student ideas and teacher questions had decreased in a majority of cases in 1972-73 and that the amount of teacher lecturing had increased in nine out of eleven cases.

72-40 Del Mod Fellowships, An Attempt to Train Science Education Leaders
Director: Robert Uffelman
University of Delaware Project
6 Participants

An auto-tutorial package was designed and evaluated by the Science Education Department and the Del Mod Fellowship recipients to determine the effectiveness of this tool for changing teaching strategies. A post-test control group design was used. An experimental group of 30 pre-service and in-service teachers viewed the sequence of instructional video tapes and then used the simplified techniques during four ten-minute class sessions. A control group of pre-service and in-service teachers not exposed to the tapes also participated in the data-gathering session.

The package was presented in November 1972 at the annual meeting of the School Science and Math Association, and in March 1973 at the annual meeting of the National Science Teachers Association. As a result of the two national presentations, several school districts and institutions, inside and outside of Delaware, expressed interest in the video tape units as part of teacher accountability programs. Acceptance of the materials indicates this technique will become a useful tool for changing classroom teaching strategies.

72-41 Mount Pleasant School District Elementary/Middle School Articulation Program
Directors: Jack Rockwell and Barbara Logan
Local District Project
10 Participants

A coordinated and articulated program was developed for grades 6 or 7 to mesh with the program done the previous year in grades 8 and 9. A field agent was used as consultant for the program.

72-42 Biology Symposia, Statewide Information Dissemination for Biology Teachers
Director: Frank Castelli
University of Delaware Project
22 Participants

Through the Department of Public Instruction, an inservice

credit symposium for biology teachers was offered in Kent and Sussex Counties in the fall, and in New Castle County in the spring. The participants designed and conducted the symposium around topics that they themselves selected and wanted to know more about. They attended a weekly two-hour session of lecture, discussion, and hands-on experiences relating to current developments in the teaching of biology.

The participants showed great interest in new technology, such as the use of the DELTA computer in the biology classroom. They also received enthusiastically the symposia sessions on the use of mini-courses, on modularizing instructional materials, and on the BSCS update. A survey indicated that many participants intended to implement these ideas during the next academic year.

The project was supported financially by supplemental grant funds for the Population-Environment Curriculum Study (Del Mod Project 71-02).

72-43 Individual Projects for Mathematics Teachers
Director: Charlotte Purnell
Individual Teacher Project
3 Participants

Three mathematics teachers worked independently on self-designed projects with guidance from Mrs. Purnell.

Thomas Meyers of the Caesar Rodney District developed a series of slides illustrating mathematics concepts, particularly in the area of geometry.

John C.Cairns from Dover High School wrote a comprehensive booklet entitled "Introduction and Instructions For the Use of the Slide Rule."

David van Wickle of the Mount Pleasant District worked on an Alternative to a Second Level General Mathematics Course. For this he visited many high schools, Delaware Technical and Community College, and attended the National Council of Teachers of Mathematics Convention. The remaining funds were carried over for another year to allow for the writing of an outline for the proposed course.

72-44 Individual Projects for Science Teachers
Director: Charlotte Purnell
Individual Teacher Project
13 Participants

During the 1971-72 operational year, it was noted that a group of teachers existed who had considerable expertise and training for whom no Del Mod programs were designed. This group had ideas for a particular need for their own situations but needed a stimulus to get started. Accordingly, a flexible program was designed by which individual teachers could receive a grant of up to $400. Support for the program came from Hercules, Inc. and residue monies from the Director's programs.

Thirty-eight requests were received. These were reviewed by the American Chemical Society Education Committee for recommendations and the component coordinators made final decisions. Following are the thirteen people who were funded for various amounts.

Roberta J. Hopkins, Appoquinimink, Supplementary Kits for Individualized Instruction
Verna Price, Capital, Nature Trails
Bryan Bennett, Seaford, Ecological Slide Series
Patricia Bathon, St. Mark's High, Environmental Science
Sister Elaine Wheeler, St. Mark's High, Awakening Interest in Science
Philip Hershey, New Castle-Gunning Bedford, Develop Supplementary Material for I.M.E. Program at William Penn
Gary Dunkleberger, Alexis I. duPont, A System for Initiating Self-Paced Labs
Robert Johnson, Indian River, The River At Our Door
Robert Loynd, Alfred I. duPont, District Culture Center
Thomas Darden, Seaford, Individualized Instruction Through the Use of Science Kits
John Hollis, Seaford, Individualized Instruction Through the Use of Science Kits
Dale Reynard, Alfred I. duPont, Computer's Role in Chemistry
Rosalie Cline, Lake Forest, The Ecology of Delaware's Coastal Zone

When the projects were completed, the teachers submitted to the Director's office either a report of their activities or a copy of the materials developed, whichever was available.

72-45 Science Curriculum Articulation in the Mount Pleasant School District
Director: Anthony De Angelis
Local District Project
6 Participants

Six science teachers from Mount Pleasant High School met twice to discuss additional or revised course offerings for the science department. The main concern was the senior year courses in Biology, Chemistry, and Physics.

In the first meeting, a mini-course approach was discussed involving project science and independent study in the three areas of science, career science (in terms of teaching, research, medicine, and laboratory technology), and computer science. The means of implementing these, and the credit to be given were suggested.

Communication with schools in the surrounding area, McKean, Brandywine, and Concord High Schools, was deemed beneficial.

In the second meeting they continued the consideration of the senior science courses. Details about class sizes, number of meetings, and general implementation necessities were cleared up. The teachers also decided that the advanced placement program could be revised and formalized with respect to the new science courses.

72-46 Inorganic Chemistry for Teachers of Science (C551)
Director: Dr. Wayne Anderson
University of Delaware Project
7 Participants

A symposium on the topic "Acids, Bases and Chemical Reactivity" was designed to bring chemistry teachers up to date in modern acid-base theory. This topic was chosen because it is traditionally covered in high school courses. Bronstead-Lowry and Lewis acid/base concepts were reviewed, followed by an introduction to the concept of hard and soft acids and bases. Lectures were presented by two University faculty members.

Although a generally favorable response to the topic was received, several participants commented that the material was at too sophisticated level for use in their own classrooms. Due to the many positive comments, symposia are planned for the coming year dealing with other topics.

72-47 Science Education Technician Project Program
Director: Mrs. Mary Stein
Delaware Technical and Community College Project
4 Participants

This program was designed to train para-professionals to assist science teachers in carrying out their responsibilities. A Science Education Technician Advisory Committee assisted in reviewing the general objectives of the technician training. A sub-committee worked out a curriculum dedicated to maximizing lab experience. After an initial training period, the participants worked as interning technicians in those schools that were willing to supply a supervisory teacher.

The cooperating teachers in the technician program freely commented on the improvements they have been able to make in their programs because the technicians relieved them of many non-teaching tasks, giving them more time to concentrate on individualized, laboratory oriented activities. The use of technicians has cut down on equipment loss and damage, because the technician has been there to inventory and to supervise supplies, to repair equipment, and to prevent duplication of orders. The technician has also helped supervise students on field trips or in laboratory situations. Some of the changes tried this year by science teachers made specific use of the skills, interests, and enthusiasm of the science education technicians. Thus, a new field and laboratory unit called "Mosses and Fungi" was added to a second year biology curriculum. Other examples of expanded curricula include an investigative science program for the fourth grade students of a near-retirement teacher; field trips to pond and beach areas to observe life forms and study water conditions; independent physical science research for ninth graders; and a science club for eighth grade students. This project was continued during 1973-74 as Del Mod Project 73-24.

72-48 Computer Programming for Teachers (ED 567)
Director: David Yens
University of Delaware Project
13 Participants

Teachers used self-instructional modules to learn BASIC computer language and to learn the procedures for getting on the line with the University's Burrough Computer and with the Project DELTA computer. The DELTA computer is available through terminals located in the schools.

Most of the participants reached an acceptable level of programming competence. Evaluation at the end of the project indicated that the participants would be using the computer terminals with their classes for simulation or problem solving. Most indicated that they would like to continue to learn other computer languages either for class use or for personal improvement. During the summer of 1973, several teachers used the instructional module to learn how to operate the computer terminals. They have also volunteered to assist in developing additional programs for classroom trial.

72-49 Course in Contemporary Science (SC601)
Director: Robert Gagne
University of Delaware Project
4 Participants

In a continuation of Project 72-14, Dr. Gagne and four teachers who were recipients of Del Mod Fellowships assembled modules and equipment for laboratory activities to accompany the basic course in physical science for elementary school teachers. These materials will be made available through the Del Mod Resource Centers.

72-50 Parttime Field Agent Activities in Astronomy and Environmental Education
Director: Thomas Hounsell
Local District Project
34 Participants

Prior to 1971, there was no coordinated program in the elementary schools. A project, started in 1971, to set up a central storage system with prescription cards for science proved that common materials would not reach all teachers. During the past year time was spent in the Alexis I. duPont School District to refine the system and begin implementation of the SCIS program. Release time was provided the teachers by hiring a planetarium instructor who worked with the children while the science coordinator worked with teachers and building principals.

72-51 Science Articulation Program for the Stanton School District
Director: Frances Barhydt
Local District Project
13 Participants

Together with the building principals, the science teachers have redesigned their elementary, junior high, and high school programs in terms of performance objectives in order to articulate the programs of feeder schools with the high schools. A side benefit of this program has been better communication and the realization of the need to change.

72-52 Followup of Project 71-08
Director: Barbara Logan
Field Agent Project
32 Participants

Barbara Logan conducted follow-up activities with teachers who had participated in her 1971-72 seminars. The type of service requested by these teachers indicates the impact of the previous year's seminars. There were 18 requests for further video-taping experiences, nine requests for a critique of questioning techniques, and three requests from schools for assistance with curriculum change. There were also isolated requests for aid with the planning of specific activities, more utilitarian organization of equipment, and locating specific resources.

The single most common observation made was that of increased student activity. Most teachers had incorporated lessons involving their students in the manipulation of equipment and the collection of data.

73-01 Mathematics Inquiry - Conrad School District
Director: Richard Koch
Local District Project
12 Participants

Participants received instruction in the use of the geoboard, Cuisenaire rods, attribute games, chip trading, multibase blocks, abaci, instructional games, open-ended classification units, activity cards, geoblocks, tangrams, mirror cards, stern material, unifix rules, and logical blocks.

Presentations were made on the kinds and uses of diagnostic tests, equally acceptable multiple response answers, the units and conversions within the metric system, rounding of numbers, pentominoes, and grouping procedure.

Several junior high school teachers developed plans for team teaching of the lower-half-ability-level students in grades 7 and 8, and to develop mini-units for general mathematics in grade 9. Included were writing of objectives and selection of materials and methods of presentation.

The group was pre- and post-tested on two semantic differential scales labeled "Mathematics and Me" and "The Teaching of Mathematics". Seventeen of the materials used in the workshop were also identified by the teachers on a pre-post competency measure. This evaluation, on file in the Del Mod office, is a good indication that the workshop was successful in presenting the materials listed in the above summary.

73-02 Physical Science/Mathematics Workshop - Wilmington District
Directors: Paul Rogler and Meredith Griffin
Local District Project
22 Participants

All mathematics and science teachers in grades 6-8 examined new materials and made recommendations to the district for better ways of meeting the needs of the students in the district. Time was allowed for teachers to see and examine curriculum materials displayed and used at the University and the Department of Public Instruction. Blocks of time were allowed for teachers to demonstrate new methods and techniques for laboratory and classroom experiences.

Through this workshop teachers were asked to develop some general plans to generate interest in the physical sciences. The sequential order of the programs presently being offered in the district were evaluated. Teachers were allowed to visit other districts in groups. Consultants were invited to work with the teachers as well as to do some demonstrations.

Out of this project, which was held in June 1973, developed the program for a special field agent for Wilmington which went into operation in October by means of a supplementary grant from the duPont Company.

The science portion of this workshop as reported by Meredith Griffin is an excellent evaluation of problems and concerns of science teachers in the Wilmington School District. Mr. Griffin subsequently became the field agent for that District, and his objectives for the 1973-74 school year addressed themselves to these problems and concerns.

73-03 K-4 Curriculum Development
Director: Thomas Hounsell
District/Field Agent Project
44 Participants

The Alexis I. duPont School District launched an effort toward the individualization of the School curriculum. The science activities are designed to be a part of an overall K-12 multidisciplinary program in population environment studies. A pilot program is presently in use in the elementary and middle schools of the district in grades K-6 with plans to extend it through seventh grade. This system utilizes a central card file which contains individual prescriptions for learning. The activities have no grade level or age designation and in many cases are non-sequential. This permits complete freedom of choice based on the child's interests, needs and capabilities.

The program involved all teachers who have been trained by Del Mod in methods of science education. They acted as instructors in a series of total faculty inservice dissemination seminars. These seminars were scheduled on a regular basis so that experienced teachers might assist the rest of the staff in the use of new materials and techniques. School principals participated in the summer workshop. This enabled them to gain a more complete understanding of what teachers were doing. Consequently, they were a tremendous asset in the total implementation phase. All classrooms in the district grades K-7 had switched from conventional to individualized instruction by June 1974.

73-04 Curriculum Guidelines in Science/Mathematics/ Environmental Education
Directors: John Reiher and Thomas Baker
Department of Public Instruction Project
24 Participants

In accordance with the Delaware Code, the Office of Science and Environmental Education has developed Equinox, minimal guide-

lines for the natural science education curriculum in Delaware's schools. Equinox has been developed at three levels: Kindergarten to first grade, second through fourth grades, and fifth through eighth grades. Equinox was initially developed during the summer of 1973 and was evaluated by nearly three hundred teachers during the 1973-74 school year. The guide will provide the minimum standards for all science programs in Delaware. Equinox for the secondary schools, grades nine to twelve, will be completed in the fall of 1974. Although work has begun on the mathematics and environmental education guides, they are still very much in the developmental stage but are expected to be completed by December, 1974. A partial product of this project is available in the forms of three booklets prepared for K-1, 2-4, and 5-8th grades.

73-05 Math Activities for Student Involvement
Director: Charles Eisenbise
Local District Project
7 Participants

Project participants from the Mount Pleasant School District were involved in discussions centering around what constitutes a good activity and how best to implement a lab approach to the teaching of mathematics. Numerous sets of existing activity cards were reviewed and evaluated. Many activities were modified to meet particular needs. In addition, new activities were designed based upon the ideas arising out of discussions with Barbara Logan.

In all, 264 activities were identified, written up, and keyed into the twelve major strands of the mathematics curriculum for grades 3-5. A teacher's guide for the implementation of these activities was developed also. The teacher's guide was printed commercially and was available in October.

Teachers in seventh and eighth grades have already begun to develop additional activities for a seventh grade lab. The utilization of the cards next year in grades 3 to 5 will provide the impetus for a similar project in grades 6 to 8.

73-06 Milford District Science Articulation
Directors: James Gussett and Glenn Moyer
District/Field Agent Project
16 Participants

Funds were provided by Del Mod to pay for substitute teachers used to free regular classroom teachers during the school day. These teachers researched, designed, wrote, published and distributed a coordinated K-8 science program suggested for implementation in the Milford School District in September of 1974. Materials were also selected and purchased through this committee that were necessary for implementation. They were assisted in their efforts by Mr. James Gussett, Del Mod Field Agent.

Two curriculum guides for grades 1-5 and 4-8 indicate that Milford has responded to suggested State objectives and guidelines. The guides are sequential in nature so that teachers can anticipate future needs of children but within a given level are independent and minimal. These features should enable a teacher to take a flexible approach to the various units within each level similar to the ESS designed activities.

73-07 T.I.E.S. Project
Directors: John Reiher, William Geppert, Thomas Baker
Department of Public Instruction Project
7 Participants

A program to provide awareness for computer education was held during the second week in December for district and secondary school administrators. The consultant from the T.I.E.S. Project, Mr. Thomas C. Campbell, focused the program on the system used in Minnesota, Total Information Educational Systems, known as T.I.E.S.

73-08 Math Curriculum Development K-8, Seaford District
Director: Arthur Ellis
Local District Project
7 Participants

A K-8 mathematics guide was developed which included a sequence of concepts, skills, and suggested activities. The guide was reviewed by all mathematics teachers in the district and subsequently revised based on feedback.

The guide was approved by the Seaford Board of Education and will be used during the 1974-75 school year. Local funds have been approved for a grade 9-12 extension of the guide.

73-09 Science Grades 2-4, Appoquinimink School District
Director: Dennis Reilly
District/Field Agent Project
8 Participants

As a result of a teacher survey, a science/environmental education plan was proposed. Mr. Reilly assisted the teachers in a series of monthly meetings with adaptation of the existing SAPA material in the district to the immediate environment of the schools in the district. He gave in-the-field assistance on numerous occasions to the individual teachers on the mechanics of such a move. In addition, several grade-level field trips were organized. The teachers were also given assistance in using SAPA environmental materials as a vehicle for stimulating interest in reading.

73-10 SAPA and Environmental Education K-3
Director: Dennis Reilly
District/Field Agent Project
23 Participants

Curriculum development utilizing environmental education was developed in conjunction with SAPA. These materials were edited and distributed throughout the district. The conclusion of K-3/SAPA curriculum development has led to the examination of 4-6th grade materials. These will be revised in the 1974-75 school year.

73-11 Summer Elementary School Physical Science Workshop
Director: Winston Cleland
Local District Project
15 Participants

With the assistance of Dennis Reilly, Del Mod Fellow, a performance-based semi-individualized Newtonian Mechanics module incorporating SAPA exercises was introduced. Graphing skills, and techniques for gathering, organizing, and interpreting data were utilized. In addition, outdoor activities were demonstrated.

The teachers involved in the workshop were pre-post tested and significant gains were realized in their mastery of the materials presented. Teacher comments were favorable with the conditional response that future activities should be taught in a well explained manner. For example: classroom use of the materials must be understood by the teachers.

73-12 Science Curriculum Study Grades 5-12
Directors: Dorothy Taylor and James Gussett
District/Field Agent Project
9 Participants

A team of science and health teachers from the Laurel School District identified as a district need the desirability of integrating science courses with health education. A representative group met for one week during the summer with a Del Mod Field Agent to devise strategies for implementation. Considerable time was spent during the workshop on reconciliation of various philosophies held by participants. The resultant products were guidelines of reinforcement of some basic physiological processes and prevention of duplication of effort. Changes in staff assignment during the summer somewhat nullified the planned implementation. The agent continued to meet on a monthly basis with as many of the group as possible to lend assistance to the plan.

73-13 Indian River District Mathematics Guidelines, K-8
Director: Ralph Mahan
Local District Project
11 Participants

Teachers from each grade, K-8, from each building in the District were involved in the production of a mathematics curriculum guide. The guidelines were coordinated with State objectives, the newly adopted district math textbook series, and with science-related math activities.

The product of this effort is on file in the Del Mod office: "K-8 Mathematics Guidelines, Indian River School District." A similar project has been suggested for K-8 science guidelines.

73-14 Caesar Rodney Activity Centered Math
Director: Winifred Cooper
Local District Project
19 Participants

Teachers in grade two of the Caesar Rodney district were taught in the use of geoboards, surveys, the 100 board, tic-tac-toe, number lines, pebbles in a bag, "What's My Rule?", chip trading, Kalah, pattern blocking, attribute blocks, attribute games, Cuisenaire Rods, and concepts of measurement.

Two follow-up workshops were held during the year and teacher enthusiasm was sustained. A survey of teachers indicated that the workshop was well planned, executed and worthwhile.

73-15 Sequential Skills in Science/Math
Directors: Barbara Logan, Peter Shannon and Hess Wilson
District/Field Agent Project
11 Participants

During the one-week summer workshop, the participants from the New Castle-Gunning Bedford School District attempted to identify areas of overlap in math and science. Cooperative teaching units were prepared and field tested during the school year. Units on graphing, measurement as applied in outdoor settings, and on radio were prepared.

The graphing unit was revised after use in the classroom. The length of the unit was shortened. The three units are on file in the Del Mod office. Several follow-up activities are scheduled during the 1974-75 school year to realign science-math objectives in the district.

73-16 Environmental Education Field Studies
Director: Michael Riska
Local District Project
20 Participants

Mr. Riska, naturalist for the Delaware Nature Education Center, conducted ten inservice sessions in the Wilmington District with selected fifth and sixth grade teachers. These workshops were designed to provide teachers with some basic knowledge about the environment, problems with environmental control and techniques for the integration of environmental educa-

tion into the mathematics and social studies programs. Since the fifth and sixth grades are organized into teaching teams the participants developed a plan for implementation of environmental education. The techniques and materials were tried out during the second semester and the results provided to the Del Mod Field Agent for Wilmington.

73-17 Primary Science Workshop K-4
Directors: Darlene Bolig and James Gussett
District/Field Agent Project
41 Participants

A team of five teachers from the Caesar Rodney School District, each representing grades K-4, were trained by a Del Mod Field Agent in SAPA teaching procedures, materials and philosophy. These five teachers were responsible for training other teachers during the school year. Classes met twice a month for eight months, and each instructor conducted at least one class at the Resource Center in Georgetown.

Teacher comments at the conclusion of the school year reflect a greater awareness of the advantages and limitations of SAPA lessons and materials. Class size was frequently listed as a problem in the coordination of SAPA lessons.

73-18 Field Agent Activities (New Teachers)
Director: James Gussett
Field Agent Project
54 Participants

The participants were Kent and Sussex County teachers who had not previously worked with a Del Mod field agent. Several objectives were agreed upon by the field agent and local district personnel. After SAPA had been adopted by the district, the field agent helped implement it and provided the teachers with the philosophical background for SAPA. Several math-science related activities were started.

Work with "new" teachers requires a great investment of field agent time and yields a moderate return of concrete results. Specific programs usually result only after a second year of field agent assistance.

73-19 Field Agent Activities - Followup of 1972-73
Director: James Gussett
Field Agent Project
14 Participants

Follow up of teachers who had worked with Mr. Gussett in 1972-73 . The teachers were admitted on a first-come, first-served basis. A variety of activities resulted, including video taping, planning of field trips, implementation of SAPA lessons, and assessment of Seaford School District's curriculum guide. Several of the participants seemed to feel that the Del Mod Field Agent was to be used as a resource rather than as a facilitator in planning lessons. Mr. Gussett made a point of not doing the teachers' work for them, but instead encouraged and assisted them in trying new techniques on their own.

73-20 Field Agent Activities (New Teachers)
Director: Barbara Logan
Field Agent/University of Delaware Project
18 Participants

Barbara Logan conducted seminars for teachers in New Castle County. Various science programs were examined and teaching strategies were surveyed. Participants prepared and presented in the seminars demonstrations of various strategies. Field Agent Logan is housed and the seminars were conducted at University of Delaware facilities.

These seminars provide an excellent opportunity for Del Mod Field Agents to establish initial contact with new teachers and to introduce them to the field agent concept. Follow up is planned for the 1974-75 school year.

73-21 Culture Center
Director: Robert J. Loynd
Individual Teacher Project
1 Participant

Mr. Loynd attempted to establish a culture center in the Concord High School. For many months, the facility was the victim of construction strikes. It was finally completed in the spring of 1974, and was scheduled to open in the fall.

73-22 Science Articulation - Stanton District
Director: Barbara Logan
Field Agent Project
16 Participants

This project is the continuation of the 1971 articulation program. As the result of the consolidation of two districts the need existed for an articulated K-12 program. The task was originally assigned to the part-time Del Mod agent. Changes in administration resulted in the reassignment of the project to a full-time Del Mod field agent. The model was completed during the Fall of 1972 and revised during the Spring of 1973. In addition the group determined equipment needs for the implementation of the model. It was discovered that much of the material was on hand but needed reorganization, a task which the group proposed to do in the summer; in the interim the district purchased as much material on the recommended list as feasible.

73-23 Applications of Math for Secondary Teachers
Director: Clifford W. Sloyer
University of Delaware Project
35 Participants

This course had a full school year's duration. Project 73-23 was conducted in the fall of 1973 and was continued as Project 73-27 during the spring of 1974. In this course, secondary teachers were introduced to practical applications of mathematics. Examples and models which were presented and discussed were chosen to elucidate the relationship between the so-called "symbol playing" of the mathematical literature and the world around us. Applications were chosen from physical, social, life, management, and vocational sciences. The applications were intended to be of value to teachers of students in academic as well as non-academic programs. This course also enabled the participants to better understand, evaluate, and approach the various interdisciplinary programs, many of which are still in experimental stages. The course reflected a direction indicated in many new secondary level math programs. Also recent bulletins of CUPM concerning courses in teacher training have suggested an increased stress on application of mathematics so that teachers can approach new programs and curricular changes with confidence.

Each participant prepared five projects on applications of math and these and other materials were made available throughout the State as resource material for mathematics teachers. Some of

the materials have been accepted for publication in The Mathematics Teacher or in School Science and Mathematics. In addition to the teachers in the course actually using the presented materials in their own classrooms, at least one secondary school in the State has developed an entire course based on these materials.

73-24 Science Education Technician Program
Director: Mary Stein
Delaware Technical and Community College Project
5 Participants

This project is the continuation of Del Mod Project 72-47. Activities of the participants included both class work at DTCC and internship experience in public schools. Students acquired skills in laboratory procedures, safety procedures, use of various audio-visual equipment, inventorying, ordering from vendors, assisting teachers, demonstrating techniques, and live animal care. The participants also devoted considerable effort to studies of related fields. Project Director Mary Stein's primary duties were recruiting, instructing, tutoring and advising the participants. She also visited with potential employers when it became apparent that public schools would not have funds available for the technician program.

Since the State did not legislate monies for technicians in the public schools, the project was terminated. Future projections for this program will have to be addressed to the fiscal realities of public schools.

73-25 SAPA Grades 3-4
Director: Dennis Reilly
District/Field Agent Project
11 Participants

The Del Mod Field Agent met with Capital School District personnel to plan a schedule and school-by-school evaluation of SAPA. Teachers and principals were presented with new approaches to SAPA and most schools had success with SAPA during the 1973-74 school year.

District commitment to SAPA was reflected in the acceptance of the program and of the field agent. No hard data are available to support the existence of this commitment, but the field

agent has been asked to continue the program during the 1974-75 school year.

73-26 Science K-4
Director: Dennis Reilly
District/Field Agent Project
29 Participants

Second and third grades in the Marshallton-McKean District are using the SAPA curriculum. Fourth grades in all schools should be ready to fully implement this program in September. This was achieved by visiting each building principal and teacher involved in the program to determine needs. Follow up took the form of team meetings, work-release time, district grade-level meetings and individual classroom demonstration lessons were requested. Mote and Marshallton developed a centralized storage area while Marbrook used local classroom storage.

73-27 Applications of Math for Secondary Teachers
Director: Clifford W. Sloyer
University of Delaware Project
29 Participants

This project is the spring semester continuation of Del Mod Project 73-23. For details about this project, see Project 73-23.

73-28 Chemistry Education Project (Fall)
Directors: Wayne Anderson and Verne Wood
University of Delaware Project
16 Participants

This project and its spring semester continuation 73-29 were essentially updated and expanded repetitions of the previous year's Project 72-31. Project 73-28 consists of the University course Environmental and Consumer Chemistry. Topics included air pollution, sewage treatment, food additives, heavy metal poisoning, phosphates, pesticides, and nuclear power.

In their written evaluations, the participants stated that the course had been interesting, applicable, enjoyable, and very well organized.

73-29 Chemistry Education Project (Spring)
Directors: Wayne Anderson and Verne Wood
University of Delaware Project
15 Participants

This project is the continuation of Project 73-28. Most of the participating chemistry teachers attended both projects. Project 73-29 consists of the University course Basic Concepts of Chemistry. The course was designed to bring science teachers up to date in several topics of chemistry at the freshman chemistry-major level. Topics included the periodic table, chemical equilibrium, acid/base equilibria, chemical knetics, and chemical thermodynamics. Also, several symposia were part of the project. Symposia topics included coordination of high school and University chemistry courses, consumer chemistry, and demonstrations in chemistry. The Delaware Section of the American Chemical Society and the Department of Public Instruction assisted Del Mod in sponsoring the symposia.

Very favorable comments were received on the symposia, but the course was less successful. The course director had hoped that biology and physical science teachers would benefit from a more thorough treatment of general chemical topics. He also thought that chemistry teachers would benefit from the opportunity to see someone else's approach to these topics. In practice, both objectives could not be met in the same course. The chemical background of the physical science and biology teachers was too weak for them to solve problems at the freshman chemistry major's level. The course director concludes that a less rigorous approach is needed for these teachers. Next school year a greater emphasis will be placed on laboratory experiences.

73-30 Mathematics Program - Mount Pleasant High School
Director: William P. Fentzloff
Individual Teacher Project
1 Participant

Mr. Fentzloff had intended to investigate and present alternate methods and instructional materials for a general mathematics course. Because of conflicting obligations, the project was never done, and the grant reverted to the general Del Mod funds.

73-31 UPSTEP
Directors: Ralph Hazelton and Columbus Ricks
Delaware State College Project
9 Participants

This undergraduate preservice science teachers education program is now in its fourth year and is a continuation of Del Mod Projects 71-24 and 72-25. The program is designed to train undergraduate students to become qualified elementary or junior high school science teachers. Beginning with the sophomore level, students are provided with the practical experiences required to function as classroom teachers.

In June 1974, the first two students completed their student teaching and other requirements for the bachelor's degree. Each has been placed into a full-time teaching position. In addition. four UPSTEP students qualified for the Dean's list during 1973-74.

73-32 Astronomy for Middle and Secondary School Teachers
Director: Eshan Helmy
Delaware State College Project
22 Participants

This college course was specifically designed to update and strengthen the astronomy background of elementary and middle school teachers. Planetarium and observatory facilities were used to demonstrate teaching techniques. Lectures were given on such topics as celestial bodies, construction of telescopes, range finders, celestial coordinate systems, star finders, simulated lunar and earth surfaces, sundials, and shoe box spectroscopes. During the second semester, Delaware State College staff visited the teachers in their schools and classrooms.

Pre- and post-questionnaires revealed a significant improvement in the participants' knowledge of the subject matter. Although some participants, in their course evaluation, suggested shortened lecture and discussion periods, most saw the course as a highly positive experience. Several considered it the most interesting inservice course they had ever had.

73-33 Math/Science Lab
Director: Philip Capriotti
Individual Teacher Project
1 Participant

With the aid of a Del Mod grant, Mr. Capriotti established and stocked a mathematics and science laboratory at the Henry duPont Middle School.

73-34 Math Field Agent - New Castle County
Director: Peter Shannon
Field Agent Project
39 Participants

Mr. Shannon, who was new to Del Mod this year, worked in eight New Castle County school districts. His prime responsibility was follow-up activity with those teachers who had been involved in previous Del Mod math-lab courses. His activities included text selection, inservice programs, development of math labs, implementation of DMP materials, and an activity-oriented workshop. Most of the assistance was based on individual teachers' need and background.

Mr. Shannon felt that the multitude of school districts and activities prevented an adequate follow-up effort and placed a strain on his budget. To improve his program for next year, he started setting up firm commitments with a limited number of school districts. He also intends to establish a completely planned time table for the year in order to maximize the efficiency of his effort.

73-35 Math Field Agent - Kent and Sussex Counties
Director: Richard Cowan
Field Agent Project
55 Participants

In 1973-74, mathematics became a full entity in the Del Mod System. Dr. Cowan, a newly hired math field agent, conducted three separate programs: Individualized Junior High School Mathematics, Metric Goals and Objectives, and Follow up of Math Lab I. He acquainted teachers with new materials, developed classroom activities, and assisted with the development of a metric-oriented curriculum guide. Dr. Cowan visited and consulted with all participants in their own classrooms.

Since the math field agent was a new concept to Delaware teachers, Dr. Cowan found that he had to take time to introduce districts to his skills and talents preparatory to a more thorough and specialized assistance for mathematics teachers in the concerned districts.

73-36 Inservice Programs
Directors: John Reiher and Thomas Baker
Department of Public Instruction Projects
222 Participants

Nine school districts, the Wilmington Catholic Diocese, and private schools conducted twenty-one DPI assisted workshops on inservice days in October 1973 and March, 1974. This project constitutes the workshops during October; project 73-47 is the March workshops. Eight of these were metric workshops, seven were math activities oriented, two were science activities oriented, two were science-math curriculum development projects, and the remainder were environmental education workshops.

73-37 Science Project for Claymont Middle School
Directors: Barbara Logan and Frank Gavas
District/Field Agent Project
5 Participants

An analysis of science program was conducted and the program was revamped to incorporate the Natural Science Objectives for the fifth through eighth grades as set forth by the State Department of Public Instruction. The sixth grade teachers prepared sample evaluations related to the specific unit objectives. The seventh grade life science is developed on multi-text approach and the eighth grade segment includes suggested activities to accompany the specific objectives. These variations reflect an attempt to correct major areas of weakness in the former program.

Several meetings were held with the high school and elementary personnel to ensure smooth transition for the student from one level to another. The product of this year of work is entitled "Claymont Middle School Science Curriculum". In addition, the science department hopes to continue the work to include construction of assessment ideas based on the specific objectives and to construct or identify a means to evaluate teacher growth. It is also anticipated that similar efforts to better define objectives at the fifth grade level will be made.

73-38 Science Curriculum Development for Mount Pleasant Middle School
Directors: Barbara Logan, Jack Rockwell, Stewart Harrison
District/Field Agent Project
16 Participants

The participants met in monthly sessions to identify content and to construct objectives suitable for the fifth and eighth grade science courses of study. These sessions resulted in a manual stating the overall behavioral objectives, concepts and content suggested for fifth and eighth grades.

This complements the work done last year for the sixth and seventh grades and ensures complete stepwise coverage of the minimal objectives as suggested by the Department of Public Instruction.

During writing sessions scheduled for summer and early fall, suggested activities and listing of materials needed to implement the program will be prepared. An on-site follow-up will be conducted next year to assist in the implementation of the units developed. This follow-up will include sessions on teaching techniques as well as in-classroom assistance.

73-39 Motions in Space
Director: Helen K. Moncure
Individual Teacher Project
1 Participant

With the duPont grant, materials for the study of motion in space were prepared for the senior high school level. The package included sky photographs and constructed models of the photographs. Ms. Moncure also wrote a planetarium presentation to accompany the observation and measurement of celestial motion in laboratory experiments.

73-40 Metric Task Force
Directors: John Reiher, William Geppert, Thomas Baker
Department of Public Instruction Project
38 Participants

A working task force of educators representing all segments of the educational community in the areas of science and mathematics were called together for the purpose of developing the follow-

ing: a) a plan for implementation of metric for the State; b) a training program for representatives from each district to serve as the leaders in the local district for metric; c) development of resources available for teachers of metric. Although the metric system is useful to science and mathematics components of the Del Mod System, this project was designed to kick off statewide implementation of metric.

73-41 Wilmington Science Intern
Director: Meredith Griffin
Field Agent Project
45 Participants

Mr. Griffin's responsibility as science intern was to coordinate science activities at the secondary school level. He found that teachers were either unaware of or were ignoring a science curriculum guide which had recently been published by the Wilmington School District. Mr. Griffin instituted regular curriculum meetings and got the teachers involved in the articulation of science curricula at each grade level and between grade levels. He also helped the teachers construct an inventory of equipment and materials needed in each school. The participants also discussed improvements in curricula materials with special emphasis on hands-on-laboratory experiences. Mr. Griffin worked toward an integration between science and other related skills. To that end he got science and math teachers to work together on related problems and arranged for a very successful workshop on the teaching of science-content reading skills.

As a result of this project, all teachers now possess the Wilmington Science Curriculum Guide and are conforming to objectives within the guide. Mr. Griffin also assisted with the writing of curriculum guides for courses which previously had no guides. The teachers have become highly motivated and feel that they have a chance to succeed in the classroom. At the end of this project, many teachers were even working on their own time during the summer preparing for their fall courses. It can be concluded that teachers will change attitudes and habits if they are shown that they can expect a measure of success in their classrooms.

73-42 Comet Kohoutek
Directors: John Reiher and Thomas Baker
Department of Public Instruction Project
415 Participants

A series of lectures and planetarium demonstrations which focused on Comet Kohoutek were developed. The programs were held in the northern and central parts of the State. Participants attended a dinner, heard a guest lecturer speak on the comet and then were transported to a planetarium for a visual demonstration. Each person was given a copy of the NASA publication on the comet for use in their classroom as well as other classroom activities and a special edition of the Newsletter which focused on the comet.

73-43 Field Workshop (Math)
Director: John Reiher
University/Department of Public Instruction Project
125 Participants

This math program was a University course offered in the spring of 1974 to selected teachers who were concerned about implementing math lab activities in their schools. Fifty teachers from Kent and Sussex Counties and 75 teachers from New Castle County met in Del Mod Resource Centers one night per week for 15 sessions. The objectives were to provide the participants with an opportunity to learn some mathematical concepts in an activity- and material-centered situation, to show them how an individualized mathematics learning environment can be created, to make them familiar with many of the recently developed materials available for use in the teaching of mathematics and to provide them with further experiences toward an integrated approach in the teaching of mathematics.

73-44 Algebra by Computer
Director: Rhoda Witlin
University of Delaware Project
17 Participants

This course was designed to teach the BASIC computer language to teachers and to demonstrate the computer as an effective teaching tool in an Algebra II course. The instructor followed the curriculum content of an Algebra II course and showed at each new point the advantage of using the computer in the classroom. Each week, the students were asked to write a computer

program dealing with a specific math concept that could be linked to classroom discussion. The programs were copied and shared with other participants.

The participants found this course a rewarding experience. Some suggested that the course in the future be broadened to include applications to business and general science courses as well.

73-45 Field Workshop (Science)
Directors: John Reiher and Thomas Baker
University/Department of Public Instruction Project
136 Participants

The State science curriculum guide "Equinox" served as the framework for this University-credit course for teachers in the grades K-4. Two groups of participating teachers met in New Castle County, one group in Kent County, and one in Sussex County. The objectives of the course included identification of key K-4 classroom activities in physical, life, and earth science; implementation of basic learning theories; and investigation of the philosophy of career education. The program made a special effort to develop key teachers in those districts that the Department of Public Instruction evaluation program had found in need of up-grading. Each session focused on basic learning theory, student centered activities relating to the session's general topic, relationship to the "Equinox" guide, and application to career awareness. Each session also provided minimal content background for all recommended activities.

73-46 Field Workshop (Environmental Education)
Directors: John Reiher and Roger Daum
University/Department of Public Instruction Project
32 Participants

This project was developed by the DPI in cooperation with the New Castle-Gunning Bedford School District, and was offered to K-6 teachers in Caesar Rodney, Capital, Conrad, Claymont, and De La Warr School Districts with funds from ESEA Title III. The participants received University credit. The project provided instruction in basic principles of natural history and ecology, and encouraged the use of available outdoor areas as teaching tools for extending and enriching classroom learning activities. The participants were also familiarized with existing curricular

materials, resources, and instructional techniques. Preparatory lectures were followed by field activities that involved direct learning experiences and stressed the discovery approach as a teaching format. Participants were visited at their schools by the Environmental Laboratory Program Coordinator and received assistance in using their own school grounds an an environmental study center. The Coordinator also disseminated curriculum materials to other teachers in the participant's school. Field sessions were conducted in selected field, forest, marsh, and stream environments of the Environmental Laboratory site. Occasional trips were also taken to other selected habitats in Delaware.

73-47 Inservice Programs
Directors: John Reiher and Thomas Baker
Department of Public Instruction Project
425 Participants

This project represents the workshops conducted in March, 1974 by DPI. For more details, see Project 73-36.

73-48 Math Computation Improvement
Directors: Lawrence Furbush and Frank Marburger
Local District Project
31 Participants

Topics covered in this project included the structure of the rational number system, methods of presenting algorithms, the use of the geoboard in fourth grade geometry, and the metric system. Teachers reviewed journal articles and examined the district's curriculum guide. The focus of this project was on grade-four teachers and students in the Alfred I. duPont District. The district intends to monitor student performance through the 1974-75 year as a gauge of project success.

73-49 Del Mod Field Agent Study
Directors: John R. Bolig and Horace Darlington
Research Project
50 Participants

The selection of two samples of twenty-five teachers each was intended to indicate the relative effectiveness of teachers with Del Mod field agent contacts and those teachers who had never

worked with a field agent. A video tape analysis and a TOUS test analysis were performed.

The results of this experiment will be reported in Mr. Darlington's doctoral dissertation to Temple University. This study will be on file in the Del Mod office.

73-50 Basic Arithmetic Teaching Packet
Directors: William Adkins and Mary Pritchett
Individual Teacher Project
2 Participants

The two teachers from Christiana High School developed a course packet for a Fundamental Arithmetic course where no text book existed. Their approach to this task included the following steps: 1) defining with performance objectives what should be included in a course of Fundamental Arithmetic, 2) writing brief statements to guide teachers in ways of approaching a given subject, 3) providing oral exercises where they were considered necessary, 4) providing duplicated worksheets for each topic, and 5) providing a list of available references to supplement the program.

Each teacher was to be supplied with enough packets for all the students. Plans for annual evaluation and revision of the packet were made.

73-51 Teacher Produced Slides for the Behavioral Shaping of Math Tasks in Elementary Algebra and Physics
Director: Thomas Townsend
Individual Teacher Project
1 Participant

Mr. Townsend had completed only preliminary, outline work at the end of the year, for which none of the grant funds had been expended. After an extension which produced no more results on the project, the funding reverted to the Del Mod general account.

73-52 Business and Consumer Math for the Junior High School Student
Director: J. Leverne Myers
Individual Teacher Project
1 Participant

Mr. Myers' project was based upon the purchase of calculators for Business and Consumer mathematics courses. The purpose was to integrate the calculators into these courses, expanding the possibilities of mathematical computations, and reducing the time to do them.

73-53 Development of Resource Center for Individualize Mathematics
Director: Kathryn L. Petrick
Individual Teacher Project
1 Participant

Ms. Petrick's objective was to establish a mathematics lab/resource center for the Mount Pleasant Intermediate School. Her preliminary work involved three major areas of research and preparation. The first activities, assisted by Del Mod Field Agent Peter Shannon, were visits to the math labs of other schools to determine the minimum facilities and materials needed. Ms. Petrick also spent two days at an NCTM Convention in Atlantic City, and learned about new uses of math materials in a lab situation.

Many materials and lab ideas were collected and ready for organization. Some furnishings for the math center had been procured. The final touches were to be put on the center in the 1974-75 academic year.

73-54 Field Agent Follow-up Project
Director: Barbara Logan
Field Agent Project
22 Participants

This project offered supportive services to individual teachers who had worked with Ms. Logan during 1972-73. Classroom visitations were made throughout the year upon request of the individual teacher or groups of teachers. Classroom assistance requests centered on teaching strategies and on assistance with specific new activities. There were some requests for group sessions after school or during team prep periods. In these instances, other school personnel also were present.

Although no evaluative data were collected, requests for assistance for the coming school year indicate a certain amount of success. Most of these teachers will participate in various district- or school-wide projects next year. No direct continuation of this project is planned.

73-55 Auto Tutorial Programs on the Flora of Delaware
Director: Robert J. Loynd
Individual Teacher Project
1 Participant

The basis of the programs developed by Mr. Loynd is photographs of a vast assortment of Delaware plants. From these, a slide-tape presentation was to be constructed. Because the work on such a project must be adapted to the seasons, Mr. Loynd was continuing the photography into a second year.

73-56 Individualized Instruction Through Science Kits
Director: John T. Darden
Individual Teacher Project
1 Participant

The project attempted to measure the effect of individualized science instructional kits with a homogeneous class of students. During the first year of this project, Mr. Darden experimented with self-instructional science kits in his classroom with average and above average students. More than half of the class preferred this kind of instruction; all but a few of the students completed the kits successfully.

For the second year, Mr. Darden modified these kits for the "lowest" section. He had learned that the standard self-instructional kit directions assumed an average to above average level of reading comprehension. To rectify this situation, the directions were rewritten in simplified form, with as many explanatory diagrams as possible. This method worked quite well with students with a lower reading ability and those with serious discipline problems.

The success of this method was attributed to comprehensible directions and tasks within the capabilities of the students; the result of this combination was a higher level of motivation than is normally demonstrated by the "lower" section.

73-57 Follow-up on Sequential Skills in Science/Math, New Castle-Gunning Bedford School District
Directors: Barbara Logan, Peter Shannon, Hess Wilson
District/Field Agent Project
8 Participants

This project is a direct follow up of Del Mod Project 73-15. For details, see Project 73-15.

74-01 Metric Workshop
Directors: John Reiher, Thomas Baker, Peter Shannon, Dennis Reilly, Winston Cleland, Verne Wood, Barbara Logan, John Marciarello, Richard Cowan, James Gussett
Department of Public Instruction Project
148 Participants

The group of 148 K-12 teachers met daily during the week of August 12. The purpose of this program was actually four-fold: to orient the teachers to the existence of metric-educational materials; to utilize the guide for metric education (the booklet, Introduction to Metric Measurement, written in Del Mod Project 73-04); to implement techniques of the metric system. The final fundamental goal was to train the 148 participants well enough that they might serve as resource persons for their respective districts and for the district inservice programs.

The participants came from 22 districts and several non-public schools in the State, and met in each of the three Del Mod Resource Centers. The materials utilized by the workshops were many and varied. The field agents conducted the groups and evaluated the workshop by using the pre- post-test technique.

74-02 Metric Workshop for Vocational and Industrial Arts Teachers
Directors: John Reiher, Thomas Baker, William Geppert, Barbara Logan, James Gussett
Department of Public Instruction Project
138 Participants

The goals and format of this program and of Project 74-01 were virtually identical. Familiarity with materials and teaching techniques of the metric system and encouragement to incorporate both within the classroom were the primary purposes. One-hundred and thirty-eight teachers from the State's three vocational high

schools met for a week during August with a total of five Del Mod instructors and five metric consultants. One of the consultants was from General Motors; his consultant's fee and many of the metric educational materials used for the project were donated by General Motors. The other materials were comparable to those used in Project 74-01, with appropriate emphasis on vocational and industrial arts educational needs.

This program, as with all the Del Mod Metric workshops, was deemed necessary in light of the coming change to the Metric System, both in education and throughout the country. The initial workshops were concerned with awareness and knowledge of the Metric System. This year's programs strongly encourage implementation.

74-03 New Castle-Gunning Bedford Metric Workshop
Director: Peter Shannon
Local District Project
79 Participants

This was a district-wide workshop to instruct teachers in the metric system. Five full-day sessions were attended by a total of 79 people from the New Castle-Gunning Bedford School District. The purpose was to further acquaint teachers with the Metric System and metric education techniques.

74-04 Cape Henlopen Assistance Project
Director: Richard Cowan
Field Agent Project
22 Participants

The participants in this individualized math program were seven teachers from Milton Elementary School, six from Rehoboth Beach Elementary School, two from Shields Elementary School and seven from Savannah Road Elementary School. All participants had been selected by their respective principals. For a duration of two months, the field agent spent one week each month inside each of the four schools. After an initial group meeting to set up schedules for individual assistance, all subsequent contacts were made directly in each teacher's classroom. Work in the classrooms ranged from individual student tutoring to demonstration classes.

The purpose of the project was to assist teachers with teaching strategies and with specific activities being tried for

the first time. It is hoped that the participants will now be encouraged to implement more new math activities in their teaching.

74-05 Environment and You - Minicourses
Directors: John Reiher, Thomas Baker, Barbara Logan, James Gussett, Richard Cowan, Peter Shannon
DPI/University/Field Agent Project
38 Participants

A series of mini-courses, each lasting one week, were offered to teachers during the month of August:

1) Microscope Studies, taught by Barbara Logan. Utilization of the microscope as a valuable bool for use with life science students at middle school level.
2) Making Your Room a Science Center, taught by James Gussett. Techniques for developing a classroom in which science is a part of every subject every day.
3) Integrated Mathematics and Science, taught by Richard Cowan. Ways of making mathematics more meaningful by combining math and science classes.
4) Outdoor Mathematics Activities for the Middle School, taught by Richard Cowan. Mathematical skills applied to direct and indirect measurement. Emphasis on student involvement in classroom activities and in the construction of equipment.
5) Geometry in the Classroom (Grades 5-8), taught by Peter Shannon. Understanding of geometric concepts, using such manipulatives as geo-boards, pangrams, and paper folding.
6) Environment and You, taught by Thomas Baker. Ideas for environmental studies in the elementary classroom. Based on the transparency series Environment and You.

74-06 Milford Articulation Project
Director: James Gussett
District/Field Agent Project
9 Participants

In this project, the field agent assisted the participants in articulating the existing science curriculum and constructing a revised program. The K-8 curriculum had been completed during the 1973-74 school year. In this project, a viable and exciting curriculum was compiled for grades 9-12. Simultaneously, the K-8 curriculum was being implemented in Project 74-07. The experiences

from the K-8 implementation were constantly utilized in planning and articulating the 9-12 science curriculum.

74-07 Milford Implementation Project
Director: James Gussett
District/Field Agent Project
12 Participants

This project is the implementation stage of the K-8 science curriculum that had been formulated in Del Mod Project 73-06. The teachers felt that Mr. Gussett had greatly facilitated their task of implementing this sophisticated science program.

74-08 New Castle-Gunning Bedford Master Teacher Project
Directors: James Gussett and Barbara Logan
District/Field Agent Project
19 Participants

Eight fifth and sixth grade teachers from Gunning Bedford Middle School and eleven teachers from Pleasantville Elementary School met as two separate groups in their respective schools. Both groups were searching for similar solutions to their respective science programs. The participating teachers all had student-teachers in their classrooms, and a part of this program aimed at utilizing these student-teachers for cooperative teaching activities. The Pleasantville Elementary teachers concentrated on objectives and activities for the study of heat, "sky watches", and plant and animal units.

With the field agent as an intermediary, the two groups were able to build on each other and to successfully construct related sequential objectives for science study and complementary classroom activities.

74-09 Marshallton-McKean Master Teacher Project
Directors: James Gussett and Barbara Logan
District/Field Agent Project
6 Participants

Two teachers from Anna P. Mote School and four teachers from Marbrook Elementary participated in this project. The project was practically identical in format and objectives to Del Mod Project 74-08. The teachers participated in six sessions invol-

ving articulation of existing curricula, formulation of objectives and activities, and the implementation of the resulting projects.

74-10 Humanizing Mathematics and Science
Directors: Catherine Y. Bonney and Neil Walzl
Local District Project
9 Participants

The purpose of this project was to humanize and relate math and science instruction in the Glasgow High School classroom. Four activities were involved to achieve this, and to familiarize the staff with new facilities, particularly the computer.

First, there were exchange visits between the math and science teachers of Glasgow, and the math and science teachers of the feeder middle schools.

Second, two math teachers from a computer installation at the Reading High School in Pennsylvania visited Glasgow.

The third set of activities made possible by this project was various science field trips.

The major focus of this project was a four-day inter-departmental math-science workshop involving nine staff members. Many proposals and decisions resulted from these meetings. Objectives for continued math and science communication and relevance to each other were established. Old and new courses were revised accordingly. Standard objectives for every science course were devised. The teachers regarded the inter-departmental contact the most beneficial aspect of the workshop and plans for investigation of future interdisciplinary courses (business-math, science-math, industrial arts-math-science, language/English-math-science) were made.

The installation of the computer system in the fall of 1974 created the need for at least one person with in-depth training to operate and effectively teach the system to others. The remaining funds from the "Humanizing Mathematics and Science" project were used to send Mr. Darrell A. Pelley to a five-day course at the Wang Laboratories in Tewksbury, Massachusetts, during the week of February 3. Mr. Pelley then used his knowledge to conduct inservice workshops in computer education on subsequent inservice days.

74-11 Math Manipulatives Workshop
Director: Peter Shannon
Field Agent Project
16 Participants

Teachers from the Mount Pleasant District participated in this manipulative math program. A half-day workshop was offered on "How to Use Fraction Bars", and a second half-day workshop on "Chip Trading in Elementary Schools". Six teachers participated in both workshops, the rest of the participants took part in only one of the two workshops.

The manipulatives proved very effective in the teaching of fractions and place values, and follow-up visits to the 16 classrooms aided in the implementation of these techniques.

74-12 Smyrna Metric Workshop
Director: Richard Cowan
Field Agent Project
21 Participants

This program was planned together with the principal and was conducted with K-6 teachers during the half-day inservice day. The participants were familiarized with theoretical and practical aspects of metric measurement.

74-13 Yosemite National Park Excursion
Director: Thomas Baker
University/Department of Public Instruction Project
27 Participants

This project was an addition to the originally planned mini-courses (74-05). It involved a one-week, live-in experience at the Yosemite Institute in Yosemite National Park, California. The project was an extension of the concept of "Environment and You", and afforded a "back to nature" study experience. The program at the Institute involved a study of the natural history of Yosemite National Park as evidenced by the biological and geological make-up of the Park. Fourteen of the participants received University of Delaware credit.

74-14 Algebra by Computer, ED567
Director: Rhoda Witlin
University/Department of Public Instruction Project
27 Participants

This was the third year that this course was offered. It was made possible because of an NSF Del Mod Computer Applications Grant. The purpose of the course was to initiate teachers into the use of the computer as a teaching instrument. The focus was primarily on Algebra II, but modifications were made to allow use generally in a mathematics class. The participants learned the BASIC computer language. The course was received very enthusiastically.

74-15 Science for the Elementary School Teacher
Directors: Thomas Baker, Barbara Logan, John Reiher, Sally Townsend
DPI/University/Field Agent Project
142 Participants

The participants met in four different groups and locations. All were K-4 teachers, and two-thirds of them were from New Castle County. The State Natural Science Education guide Equinox served as the framework on which all activities were based. Each session focused on concepts of basic learning theory and complementary student-centered activities, relationship to the Equinox guide, minimal pertinent content background, applications to career awareness, and classroom implementation of these activities.

74-16 Math Lab for Middle School Teachers, ED559
Directors: Charles Eisenbise, William Geppert, John Brown
University/Department of Public Instruction Project
66 Participants

The purpose and structure of this program was similar to Project 74-17. The focus, however, was on the middle school and junior high school levels. The rationale behind both programs was that physical involvement strengthens the mental concepts of mathematics. New Castle County and Kent County teachers participated in the 15-week program.

74-17 Math Lab Activities for Elementary School Teachers, ED559
Directors: Richard Cowan, Peter Shannon, Verna Sharkey, Neil Walzl, Ann Wilderman
University/Department of Public Instruction Project
111 Participants

This program was a University of Delaware graduate course in education. The course was for teachers who were concerned about implementing math lab activities in their classrooms. The groundwork for this was a study of the Piagetian developmental theory of learning and an emphasis on the preoperational and concrete operational stages of a child's development. Subsequently, a large portion of the course dealt with the proper use of concrete manipulatives in the process of developing mathematical learning with manipulatives and to establish and reinforce the logical sequence and rate in which mathematics is or should be taught.

74-18 Chemistry Workshops, C567
Director: Wayne Anderson
University of Delaware Project
23 Participants

This program was offered as a University course entitled "Laboratory Workshop for Teachers of Science". The class was subdivided into two groups: high school chemistry teachers and junior high school science teachers.

There were ten high school chemistry teachers who participated. The intent was to acquaint these teachers with laboratory projects which could be used with advanced students, and to expose the teachers to alternative teaching methods. The teachers were given lists of suggested laboratory problems involving a variety of techniques. The lectures involved the theory behind separation and purification methods. Both the high school and junior high school teachers met for three hours a week for laboratory work and one and one half hours for lecture.

Eleven junior high school teachers participated in the second group. The purpose was to acquaint the teachers with a modern, self-paced, laboratory centered junior high school curriculum. They began by working through the level Two Intermediate Science Curriculum Study (ISCS) program. They were asked to develop one or two laboratory investigations suitable for use in their own classrooms. Finally, they wrote a comparison of the

ISCS curriculum with another junior high school curriculum. The lectures were focused on chemistry concepts, e.g. stoichiometry, periodic properties and acids and bases.

74-19 Inservice Day - March 7, 1975
Directors: John Reiher, Thomas Baker, Richard Cowan, James Gussett, Peter Shannon, Dennis Reilly, Roger Byber, James Wesson, Nancy Webb, Norman Wilder, Evelyn Graham, Mike Riska, Pat Brill, Ann Wilderman
DPI/Field Agent Project
1372 Participants

Under the auspices and direction of the State Department of Public Instruction, Del Mod presented the following programs as part of the state-wide inservice day:

1. Environmental Education and You (K-4).
2. Nature Center as a Source for Environmental Education (K-8).
3. Why Johnny Can't Try (7-12).
4. Metric Awareness (K-4, New Castle County).
5. Metric Awareness (5-8, New Castle County).
6. Camping Facilities and Environmental Education (4-8).
7. Metric Awareness (K-4, Sussex County).
8. Metric Awareness (5-8, Sussex County).
9. Metric Awareness (K-4, Kent County).
10. Metric Awareness (5-8, Kent County).

This program satisfied the teachers' Inservice Day requirement and provided them with an awareness of various topic areas offered by Del Mod.

74-20 Milford Curriculum Development
Director: James Gussett
District/Field Agent Project
18 Participants.

The object of this project was to create a 9-12 science curriculum which would logically follow the K-8 science curriculum developed and implemented in Del Mod Projects 74-06 and 74-07. The participants met once a week during the 1974 fall semester. One general desire was to expand the number of course offerings and reduce the time for each individual course, so as to allow students to experience more areas of science.

As a result of this project, a highly sophisticated science curriculum was produced. The final proposal suggested 43 semester courses, ranked at four levels of difficulty. Admittance to a higher level course was made dependent on a system of prerequisites rather than on the grade level of the student. This curriculum will be implemented in the 1975-76 school year.

74-21 Woodbridge Metric Implementation
Director: Richard Cowan
District/Field Agent Project
10 Participants

The participants in this metric project took part in two workshops on the constuction and use of inexpensive metric materials as educational aids. Following these workshops, the field agent visited each participant's classroom once a week for two months. During the visits, the agent rendered assistance in the implementation of metric skills and techniques acquired in the workshops.

74-22 Milford Mathematics Objectives Committee
Director: Richard Cowan
District/Field Agent Project
10 Participants

The committee of ten Milford K-5 teachers initially met with the superintendent's committee to hear his directives on elementary mathematics. In response to these directives, the status of mathematics in the district was determined by the committee of teachers in this project, and submitted to the superintendent.

The committee then proceeded to establish goals and objectives for the elementary math program. Only the K-4 teachers continued to meet to review the objectives. It seems apparent that this will be an ongoing process, and that the entire committee will continue to review the objectives for their grade levels during the 1975-76 school year.

74-23 Milford Middle School Dissemination Project
Director: Richard Cowan
District/Field Agent Project
12 Participants

This project involved teachers in grades 5-7 for two days each week during the two-month period. The purpose was to inform teachers of the new mathematics methods and materials now available. Approximately half of this time was spent with teachers in their classrooms and half was spent in various discussions, both as a group and individually. The latter activity allowed a theoretical introduction to specific methods and materials, while the former provided a practical demonstration of new materials in mathematics.

74-24 UPSTEP - Undergraduate Preservice Science Teacher Education Program
Director: Ralph Hazelton
Delaware State College Project
14 Participants

UPSTEP, which began in 1970, has been receiving Del Mod aid since 1971. In addition to Del Mod's funding, the E. I. dupont de Nemours and Company has supplied $4,000 for ten scholarships annually. Until its inception, there was no formal science education program at Delaware State College. The College's initial step, coupled with Del Mod's funding, has allowed the original objectives to continue to be met: to train junior high school and middle school science teachers.

UPSTEP had two graduates in 1974 and three in 1975. During the 1974-75 academic year there were 14 students who had declared their majors to be Science Education. Another 360 students majoring in other areas have enrolled in UPSTEP courses. The success of this program has convinced Delaware State to maintain the program as a permanent part of its regular curriculum.

As an outgrowth of this program, Delaware State is proposing to establish a broader science program for the non-science majors. Many students, particularly females and minorities, are hesitant about pursuing careers in science and mathematics and consequently never have the exposure necessary to become aware of the kinds of abilities needed for success in science and mathematics. A more extensive science program, the direct outgrowth of UPSTEP, would provide such opportunity.

Since 1971, there have been eight graduates with Science Education degrees. Two of these people have gone on to graduate school. Five are presently teaching in Delaware public schools. One has returned to Dover Air Force Base as a civilian employee. Plans for a science education exchange program with Delaware Technical and Community College to begin during the academic year 1975-76 are in the making.

74-25 Claymont Curriculum Construction
Director: Barbara Logan
District/Field Agent Project
10 Participants

The purpose of this project was to prepare a working teachers' guide for specific science topics to be taught in grades 4 and 5. The participants in this program were from the Claymont district and represented grades K-7. The finished guide was planned to list science concepts, specific objectives and suggested activities for fourth and fifth grade science curricula. Dissemination of the guide was scheduled for June; implementation will begin in September.

74-26 Claymont Middle School Science Workshop
Director: Barbara Logan
Field Agent Project
5 Participants

A group of eighth grade science teachers met with Miss Logan for curriculum-related work. Rather than rearrange the curriculum, it was decided that the amplification and perfection of the existing program was more in order. The primary focus was on the organization of field trips to supplement the science units. In the past, there had been overlaps in field trips on some units and glaring gaps in others. This workshop attempted to rectify this. The group also attempted to determine a set of activities for use in planetarium instruction. The ultimate purpose was a more well-rounded and thought-out science curriculum.

74-27 Mount Pleasant Curriculum Construction
Director: Barbara Logan
District/Field Agent Project
12 Participants

In this full-year district-wide project, the participating fifth grade teachers constructed units for the fifth grade science curriculum. Two units complete with activities were designed: Body Systems, and Earth Studies. The State Equinox guide was used as the source for objectives. The implementation of the constructed units is planned for fall 1975.

74-28 Ideas to Reinforce Math K-5
Director: Peter Shannon
District/Field Agent Project
12 Participants

Teachers from the Claymont School District met five times in a workshop aimed at reinforcing the theory and implementation of the district's math curriculum. The field agent visited the classrooms of all participants to help implement theories and activities covered in the workshop.

74-29 Make and Take Elementary Math Workshop
Director: Peter Shannon
District/Field Agent Project
23 Participants

This workshop was held during two Newark School District inservice days. Del Mod provided the field agent, and the district provided money for materials involved. The participants were taught how to create and construct math manipulatives for use in the classroom. The participants were made aware of the fact that highly effective math manipulatives can be made much more inexpensively than they can be bought.

74-30 Activities for Middle School Mathematics
Director: Peter Shannon
Field Agent Project
11 Participants

The participating teachers from Gauger Middle School met for four sessions in a project aimed at strengthening the school's

existing math curriculum. The group concentrated on designing a set of activities to complement the teaching techniques used in the mathematics classroom.

74-31 Mount Pleasant Curriculum
Director: Barbara Logan
District/Field Agent Project
15 Participants

This project was a continuation of Project 73-38. During the 1973-74 academic year the group from Mount Pleasant Middle School met to determine the content of fifth and eighth grade science courses, and subsequently construct objectives for these courses. The committee had divided the curriculum into four units.

During the summer the teachers independently synthesized the objectives and activities into curriculum plans. The committee reconvened during the 1974-75 academic year to pull each interpretation together into one package. The field agent aided in a practical demonstration of each completed unit. The three units ready for implementation are as follows: methods in planetary science; concepts for a geology unit; and a unit on body systems. The final unit and implementation will be completed during the 1975-76 academic year.

74-32 New Castle Middle School Science Lab
Director: Barbara Logan
Field Agent Project
6 Participants

The participants were teachers with whom the field agent had worked previously. The purpose of this single-session teacher-initiated workshop was to construct, establish, and implement performance objectives for a science classroom. The field agent made follow-up visits to individual classrooms.

74-33 Newark Curriculum Guide
Director: Barbara Logan and Catherine Y. Bonney
District/Field Agent Project
26 Participants

The purpose of this one-day project was to formally introduce and demonstrate final science curriculum objectives to the

teachers. This district-wide workshop group had previously constructed a detailed list of science curriculum objectives and activities. The field agent introduced the District Curriculum Guide and demonstrated activities that might be used to implement these objectives. The field agent also added a list of career directions to which each set of objectives might lead.

74-34 Holy Rosary Metric Workshop
Director: Barbara Logan
Field Agent Project
16 Participants

The participants in this one-day workshop were all teachers at the parochial Holy Rosary School. The field agent demonstrated techniques for teaching the metric system.

74-35 Chemistry Symposia
Director: Wayne Anderson, et al.
University of Delaware Project
36 Participants

As part of the University's Chemistry Education Project, a symposium on "Variations on a Theme of Lavoisier" was designed. The purposes of the symposium were two-fold: to introduce chemistry teachers to alternative ways of teaching chemistry and to discuss with the teachers topics which the University of Delaware faculty members consider critical for students who are going to take chemistry courses at the University of Delaware.

The symposium was conducted twice in the spring. One session was in Newark on May 15, the other in Georgetown on May 22. There were six speakers altogether who participated in each day-long symposium.

74-36 Probability and Statistics for Teachers, M567
74-37
Directors: Clifford Sloyer and Henry Tingey
University of Delaware Project
58, 52 Participants

These courses were offered to every secondary school teacher in Delaware. Each semester concentrated on particular aspects of probability and statistics. The first semester focused

on basic probability and confidence intervals. Second semester concentrated on the design of experiments, Markov chains, game theory, and linear programming. For each topic examples were given which could be used in a secondary classroom. The course was designed to provide the teachers with the knowledge and tools which would enable them to introduce their classes to the area of mathematics know as Probability and Statistics.

74-38 McVey Elementary Cooperating Teachers Project
Director: Barbara Logan
District/Field Agent Project
11 Participants

The participants met for four half days to construct science objectives and activities for the elementary classroom. The main focus was on temperature, astronomy studies, and outdoor activities. Del Mod paid the participants' substitute teachers which allowed the half-day sessions to take place during the school day.

74-39 Capital District SAPA II Implementation
Director: Dennis Reilly
District/Field Agent Project
46 Participants

All participants in this one-time after-school inservice workshop were K-4 teachers. The purpose of this workshop was to acquaint the participants with methods for implementing the school district's newly adopted SAPA II science teaching package. Several specific lessons were demonstrated, and SAPA II objectives were explained. The workshop concluded with a question and answer period.

74-40 Marshallton-McKean Metric Workshop
Director: Dennis Reilly
District/Field Agent Project
27 Participants

This was a two-day after-school workshop involving teachers at Absalom Jones Elementary School and their aides. The first day they were involved in a general discussion of the metric system and its use. The second day Mr. Reilly concentrated on demonstrating methods of teaching the metric system to an elementary classroom. The teachers participated in activities

designed to enlighten themselves and to acquire ideas of implementing metric education in their classrooms. Absalom Jones provided a resource area and materials for the workshop.

74-41 Alfred I. duPont SAPA II Implementation
Directors: Dennis Reilly and Wilfred Miller
District/Field Agent Project
57 Participants

In this two-week long project, K-3 teachers from Brandywood, Channin, Alfred I. duPont, Lancashire, and Lombardy Schools were prepared for the implementation of the SAPA II science curriculum. The concepts of SAPA and of its second edition, SAPA II, were discussed at a general workshop held at the district office. Subsequently, each grade in each school met separately with the field agent, and under his guidance reorganized and converted materials from existing SAPA I kits into the new SAPA II curriculum. By converting the kits themselves, the teachers became better prepared to implement the new curriculum in their own classrooms.

74-42 Alfred I. duPont Environmental Curriculum
Director: Dennis Reilly
District/Field Agent Project
7 Participants

The outdoor environmental education program consisted of a series of meetings intent on developing curriculum programs. One fifth grade representative from Brandywine, Channin, Lancashire, Lombardy, and Shipley Elementary Schools, and two sixth grade teachers from Alfred I. duPont Elementary School met to construct outdoor environmental curricula.

A portion of this workshop involved a District pilot program at Alfred I. duPont Elementary School. In conjunction with the outdoor environmental education program, 114 students were taken on an overnight camping trip to the Downington YMCA camp grounds.

74-43 Maclary Health Curriculum
Director: Dennis Reilly
District/Field Agent Project
6 Participants

The principal and five teachers of grades one through five at the R. Elizabeth Maclary School spent two days establishing health education objectives for their school and methods of teaching these objectives. As a result of this project, a complete K-5 health curriculum was prepared.

74-44 Maclary Environmental Education
Director: Dennis Reilly
District/Field Agent Project
6 Participants

The principal and five teachers of grades one through five at the R. Elizabeth Maclary School met for two days to develop outdoor programs and curricula for the second and third grades. Also a curriculum for an overnight program was written and published.

In conjunction with this project, two field trips were taken to implement the curriculum: approximately 120 students went on an all-day excursion to Camp Wright, and sixty students took part in an overnight trip to the sam camp.

74-45 Sex Segregation of Fifth Grade Science Classes: Its Effect On Children's Comprehension of Science Processes and Facts
Director: Darlene Bolig
Doctoral Dissertation - Science
1 Participant

This experiment examined the effect of sex-segregation on science achievement and understanding of science processes for fifth grade students in the Caesar Rodney School District. The Del Mod assisted project was the basis of Dr. Bolig's Doctoral Dissertation.

Evidence of sex differences in school, particularly in the attitudes and interests of children toward various subject areas, was cited as the rationale for the study. Research indicated that boys generally do better in science and mathematics than girls. Sex-segregation of science classes at the elementary level was

suggested as a means of improving girls' achievement and interest in science.

Two all-boy and two all-girl classes were compared to heterosexually grouped fifth grade science classes by means of pre- and post-tests of science achievement and understanding of science processes.

The post test scores revealed that science achievement and understanding of science processes was no greater for children in the sex-segregated classes than for their sex-integrated counterparts.

However, through informal teacher interviews, it was discovered that children in the sex-segregated classes worked more cohesively and were more interested in science. Teachers also reported that slower students appeared to benefit more from the sex-segregated classes.

The process test used in the experiment was developed by Dr. Uffelman and his leadership project students at the University of Delaware.

74-46 Evaluating the Effectiveness of an Auto-Tutorial Video Tape Sequence Used for Training Classroom Observers
Director: Sally Kehoe Townsend
Master's Thesis - Science
1 Participant

This research was designed to test the effectiveness of the auto-tutorial video tape package with a random group of in-service and preservice teachers. The package was designed by Dr. Carlton Knight and funded by Del Mod. The results of the study were the empirical basis of Mrs. Townsend's Master's Thesis in Education.

The experimental group of twenty was allowed to view the complete video tape package extensively, while the control group of ten was given only the introductory portion of the unit manuals. Each group was asked to practice the techniques derived from their study prior to the post test session.

The results revealed that there was no competency difference between preservice and inservice teachers. There was also little statistical difference between those who received the

video treatment and those who received only the unit introductions describing the techniques. The reasons for the latter observation include the wide variance of scores within the groups, and the possible excess exposure to the tape techniques given the control group. The participant response to the auto-tutorial package was extremely positive.

74-47 Wilmington Assistance Program
Director: Meredith Griffin
District/Field Agent Project
44 Participants

Due to district and union regulations, field agent Meredith Griffin served also as the official Wilmington School District science supervisor. During the 1974-75 school year, Mr. Griffin contacted and gave substantial assistance to every science teacher in his district. The individual and group meetings included curriculum development, program implementation, test improvement, introduction and supply of materials, in-class assistance, and general discussion sessions for exchanging information, bringing up suggestions and complaints, and discussing teaching philosophies. In sharp contrast to other field agents, Mr. Griffin's position as science supervisor makes evaluation of the district's teachers a part of his duties.

As a result of Mr. Griffin's activities, students, teachers, and administrators spend more time, effort, and money on upgrading science instruction in Wilmington. At the elementary level, the number of requests for science materials and assistance has increased, and there are requests to extend the SAPA program. At the secondary level, there is a growing interest in science: two new middle school science programs and five new high school programs were introduced. Interdisciplinary science courses are very popular with the students. Teacher morale has improved drastically, for the teachers have seen positive changes and many of their ideas realized. The principals are more willing to pay attention th the teaching of science, for they see the student involvement and the new enthusiasm of their teachers.

75-01 Workshop for Construction of Teacher-made Materials
Director: Richard Cowan
Field Agent Project
7 Participants

The structure of this workshop was relatively informal. For two weeks the participants worked individually at the Materials Assembly Center at Georgetown's Delaware Technical and Community College, under the direction of Dr. Cowan. Materials were supplied for the teachers to construct mathematics manipulatives for classroom use. Each teacher made two copies of each item; one copy was for his own classroom, and the other was added to the Resource Center collection.

75-02 Mount Pleasant Model for Curriculum Development
Director: John Reiher
District/ Department of Public Instruction Project
12 Participants

Mr. Reiher met with guidance counselors and science teachers from the Mount Pleasant School District to conduct this workshop. Together they reevaluated the secondary school level science curriculum with the aid of Equinox, the State's curriculum guideline.

75-03 Geometry Teachers' Workshop, M567
Directors: John A. Brown and Willard Baxter
University of Delaware Project
24 Participants

The University offered this special seminar for secondary school teachers. During the spring of 1975, the Department of Public Instruction determined that a workshop for geometry teachers was greatly needed. This project was an outgrowth of the DPI request for such a course.

This workshop was the first semester of the course. It dealt with in-depth discussions and demonstrations of new methods of teaching geometry in the secondary level classroom. Teachers were admitted to the course only if they taught geometry in their classrooms.

75-04 Cape Henlopen CDA Math Implementation Project
Director: Richard Cowan
District/Field Agent Project
6 Participants

A vital part of the CDA mathematics program is the teacher support system which accompanies the implementation of this program. Generally, when a district purchases this program, they expend $350-500 to hire someone from the company to train teachers in the use of the CDA mathematics Program. When Savannah Road Elementary School decided to try this curriculum, Dr. Cowan volunteered to conduct the teacher training program.

The workshop of first grade teachers met alternate Tuesdays for two months to discuss the program and problems which arose as a result of its implementation. Subsequently, the field agent made himself available for similar discussions once a month throughout the year.

75-05 Woodbridge Mathematics Workshop
Director: Richard Cowan
District/Field Agent Project
4 Participants

The teachers involved in this project had asked Dr. Cowan to help them secure and make effective and inexpensive mathematics materials. The District agreed to purchase materials, and the field agent instructed the teachers in how to make many inexpensive items and how to integrate them into their math programs. The project lasted for six weeks.

75-06 Science Simulation Games Workshop, Skyline Junior High
Director: Charles Wall
District/Field Agent Project
19 Participants

Nineteen middle and high school science teachers convened on a District Inservice Day to learn what games were available to supplement classroom science. The field agent provided over sixty science games, ranging in sophistication from simple cards to expensive packaged board games. The games were grouped by subject matter and then played by the teachers.

75-07 Field Agent Activities, Woodbridge School District
Director: Charles Wall
District/Field Agent Project
3 Participants

The field agent met twice with these teachers at the Georgetown Resource Center to explore what materials were available in science education. Essentially Mr. Wall took the teachers through a guided tour of given areas of study at given grade levels in a variety of the most recent science textbooks. This activity provided the participants with a means to curriculum evaluation.

75-08 Science Field Workshop, ED559
Directors: John Reiher, Thomas Baker, Dennis Reilly, Sally Townsend, Barbara Logan, Charles Wall, Audrey Conaway, James Allen, Joseph Riley
University/Department of Public Instruction Project
151 Participants

The instructors and teachers selected specific classroom science topics to examine. Various science objectives and activities were discussed for each topic. The nine course sections met at all three Resource Centers throughout the spring semester.

75-09 Elementary School Math Lab, ED559
Directors: John Reiher, Richard Cowan, Peter Shannon, Verena Sharkey
University/Department of Public Instruction Project
83 Participants

This course, given during the 1974-75 academic year, was so successful that it was offered again. For details on what activities were covered, see Del Mod Project 74-17.

75-10 Math Lab Grades 5-8, ED559
Directors: John Reiher and Ralph Mahan
University/Department of Public Instruction Project
13 Participants

Because of its success during 1974-75, this course was given again for University credit. For more details, see Project 74-16.

75-11 Second Semester Geometry Seminar, M567
Directors: John Reiher, John Brown, Willard Baxter
University/Department of Public Instruction Project
25 Participants

This course was the second semester continuation of the Geometry Teachers' Workshop. For more details, see Del Mod Project 75-03.

75-12 UPSTEP - Undergraduate Preservice Science Teacher Education Program
Director: Ralph Hazelton
15 Participants

The UPSTEP program began at Delaware State College in 1970, and came under the financial wing of Del Mod in 1971. Since then UPSTEP has evolved into the Science Education major.

The participants were preservice middle school science teachers. Since 1971, almost a dozen science education majors have graduated; most of these people have gone on to become science teachers in Delaware. For more details on the program, see Del Mod Project 74-24.

75-13 Research Project on the Implementation of the CDA Mathematics Curriculum at Savannah Road Elementary School
Directors: Richard Cowan and John Bolig
Field Agent/Director of Research Project
2 Participants

In conjunction with Savannah Road's adoption of the CDA Mathematics Curriculum, a project evaluating the CDA program was conducted. The new program was compared with the traditional mathematics program used in the Cape Henlopen District through a series of pre- and post-tests. Scores from two years of DEAP tests and two Key Math Diagnostic Assessment test sessions were compared by school and student. Results of this study will be made known to the school district and to the individual schools involved.

75-14 Milford School District Mathematics Curriculum Development Project
Director: Richard Cowan
District/Field Agent Project
10 Participants

The same teachers who participated in Project 74-22 were involved in this follow-up project. The committee set out to develop a set of mathematics objectives for the district. They also attempted to find a program to test for these objectives, and a curriculum which would teach the objectives. The task of obtaining objectives, testing materials and curriculum samples lasted for the academic year. The committee adopted the State Mathematics Guidelines and objectives. It will make a recommendation to the Superintendent after reviewing four curricula with built-in testing programs.

75-15 Milford Middle School Implementation Project
Director: Richard Cowan
District/Field Agent Project
2 Participants

The teachers and field agent worked together for three weeks learning about the different uses of Cuisenaire rods for teaching mathematics. They were particularly interested in a method for teaching fractions, for which the Cuisenaire rods were aptly suited.

75-16 Seaford Fraction Follow-up Project
Director: Richard Cowan
District/Field Agent Project
2 Participants

As a result of a workshop on fractions presented on a fall Inservice Day, two fifth grade teachers requested an extensive period of help using the Cuisenaire Rods to teach fractions. The field agent began the workshop by teaching the students of both classes as a demonstration to the teachers. By the end of the week, each teacher had moved back into her separate classroom and was able to use the rods on her own.

75-17 Claymont Curriculum Articulation and Design
Director: Barbara Logan
District/Field Agent Project
15 Participants

This project was a follow-up of Del Mod Project 74-25. During 1974-75, a curriculum was evaluated and constructed for grades four and five. The elementary teachers convened during the 1975-76 school year to work on the curricula for grades three and four. The project focused on the implementation of the fourth grade curriculum, and the articulation and design of the third grade curriculum. The exposure to the fourth grade implementation prepared third grade teachers for implementation of their curriculum.

75-18 Newark Science Workshop Series
Director: Barbara Logan
District/Field Agent Project
11 Participants

Teachers from Wilson School were involved in a variety of workshops dealing with specific science topics. All participants were cooperating teachers, with student teachers in their classrooms. The presence of the student teachers allowed the teachers to take release time during the school day for workshops; the student teachers were given time alone with a class as a result of the workshops.

The topics studied varied workshop-to-workshop, and included units on plants, the human body, the metric system, and how to set up learning stations.

75-19 Outdoor Education Program, Sanford School
Director: Barbara Logan
Field Agent Project
10 Participants

The teachers at the Sanford School requested that the field agent teach them how to make use of the school's large wooded campus for outdoor science education. The first order of business was establishing objectives for an outdoor science program. Then, activities to meet those objectives which were feasible for the campus were designed. Finally, the field agent took the teachers on nature walks to teach them names of plants and trees, and

demonstrate nature walks appropriate for science students.

75-20 De La Warr Program for Gifted Children
Director: Barbara Logan
District/Field Agent Project
2 Participants

Ms. Logan worked with John Kinsler and Sam Wilson on a science program for gifted children. The program was planned, including objectives and activities. The field agent saw the project through implementation.

From this project an idea for a biking science trip developed. Mr. Kinsler and Ms. Logan planned the week-long trip to Cape Henlopen from De La Warr. Mr. Kinsler and two other teachers then biked to Lewes with 28 students during a very cold week in May.

75-21 Mount Pleasant Science Curriculum Implementation
Director: Barbara Logan
District/Field Agent Project
7 Participants

The purpose of this project was to implement the fifth grade curriculum designed in Del Mod Project 74-27. For more details, see Project 74-27.

75-22 Individual Teacher Assistance Program
Director: Barbara Logan
District/Field Agent Project
4 Participants

This program entailed intensive work with teachers in and out of the classroom on a variety of science topics. All the teachers were from the New Castle-Gunning Bedford District, but the field agent's contact with the teachers was on an individual periodic basis. Per special request, activities including microscope studies and surveying the school grounds were pursued.

75-23 Individual Math Teacher Programs, Channin School
Director: Peter Shannon
District/Field Agent Project
6 Participants

This project was an outgrowth of a meeting the field agent conducted with the teachers from Channin Elementary School in the Alfred I. duPont District. The meeting was intended as an introduction to what a field agent is and what a mathematics field agent can do for a teacher.

As a result, Mr. Shannon worked closely with six of the teachers, in class and out. Specific problems and activities were pursued at the request of the respective teachers.

75-24 Claymont Curriculum Guide Workshop
Director: Peter Shannon
District/Field Agent Project
9 Participants

Mr. Shannon spent one hour with teachers from each grade in the Claymont School District discussing the use of the State Mathematics Curriculum Guide. This project involved extensive follow-up work with nine teachers from Darley Road, Green Street, and Pennsylvania Avenue Elementary Schools.

75-25 Wilson School Math Activities
Director: Peter Shannon
District/Field Agent Project
11 Participants

Eleven teachers from the Etta Wilson Elementary School met with the field agent to discuss math objectives and design appropriate activities for use in the classroom.

75-26 Individual Teacher Activities, Leasure Elementary School
Director: Peter Shannon
District/Field Agent Project
8 Participants

The work in this project was individually oriented. Mr. Shannon worked with these teachers extensively in and out of the classroom on mathematics teaching problems and activities.

ADDITIONAL DEL MOD PROJECTS

In the process of compiling lists and descriptions of all Del Mod funded/subsidized courses, several previously unreported University of Delaware/Del Mod courses came to light. Ten of these projects were University graduate courses.

These courses are included because they were at least partially funded by the Del Mod System, Perhaps through a series of oversights or a gap in communications the component coordinator either neglected to report these courses to Del Mod, or never himself knew of them.

The courses are reported here merely as a list. Further details, in terms of participants and goals of the courses, can be acquired from the Registrar's office at the University of Delaware.

The eleventh project presented here was conducted by a University professor. This project was mentioned in the Del Mod System Annual Report, 1972-1973 as Project 72-40. Unfortunately, it was omitted from the Del Mod at a Glance of the same year, and participants were never formally recorded on the Del Mod teachers' roster. Hopefully the description below will rectify that oversight.

Fall 1971
Science Seminars, taught by Barbara Logan
Problems Course, taught by Dr. Robert Uffelman

Spring 1972
Science Seminars, taught by Barbara Logan

Summer 1972
ED 505, taught by B. Watt
C 666, Special Problems Lab

Fall 1972
M 566, Statistics and Probability, taught by Dr. Kearns
Science Seminar, taught by Barbara Logan

Fall 1973
ED 866, Special Problems, taught by Dr. Robert Uffelman

Summer 1974
ED 559, Science Field Workshop, taught by Dr. Robert Uffelman

Spring 1975
C 567, Lab Workshop for Science Teachers, taught by Dr. Wayne Anderson

General Science Instructional Strategies
Director: Dr. Carlton W. Knight
University of Delaware Project
57 Participants

The objective of this project was to produce six auto-tutorial video tape units designed for pre-service and in-service teachers showing them how to improve their general science teaching strategies through the use of simplified objective data-gathering techniques. The pre-service and in-service teachers who participated in the field testing evaluation of the auto-tutorial package were from the University of Delaware and several local school districts, respectively.

Sally Townsend, née Kehoe, assisted in this project. Her work in the project constituted preliminary experience and research for her master's thesis in science,"Evaluating the Effectiveness of an Auto-Tutorial Video Tape Sequence Used for Training Classroom Observers" (see Del Mod Project 74-46).